

APPENDIX F

Section 303(d) Waters

1998 303(d) List

CATEGORY 1 RECOMMENDED SECTION 303(d) WATERS REQUIRED TO HAVE TMDLS

| Water | County | Miles/Acres Affected*** | Pollutant | Source |
|--------------------------|-----------------|----------------------------|-----------------------------|-----------------------|
| <u>Streams/Rivers</u> | | | | |
| 1529 Little Beaver Creek | Phelps | 0.1 | NFR | Rolla SW WWTP |
| 1746 Big Bottom Creek | Ste. Genevieve | 0.5 | BOD, NFR | Lake Forest |
| Subdivision | | | | |
| 2916 Big Creek | Iron | 4 | Metals | Doe Run Lead smelter |
| 1224 Big Otter Creek | Henry/St. Clair | 1 | pH | Otter Creek AML |
| 2074 Big River | Jefferson | 53 | Lead | Old Lead Belt AML |
| 2080 Big River | St. Francis | 40 | Lead, sediment | Old Lead Belt AML |
| 2755 W. Fk. Black River | Reynolds | 0.2 | Nutrients | Doe Run W. Fork Mine |
| 0811 E. Brush Creek | Moniteau | 1 | Nutrients | California N. WWTP |
| 1370 Brush Creek | St. Clair | 1 | Inundation | Truman Dam |
| 1592 Brushy Creek | Texas | 0.2 | NFR | Houston WWTP |
| 0859 Brushy Fork | Pettis | 1 | BOD, NFR, NH ₃ N | Sedalia Central WWTP |
| 3269, 3273 Buffalo Creek | McDonald | 15.5 | Nutrients | Livestock production |
| 3118 Buffalo Ditch | Dunklin | 2 | BOD | Kennett WWTP |
| 0709 Bynum Creek | Callaway | 0.3 | Sediment | Auxvasse Stone Quarry |
| 9000 Cave Spring Branch | McDonald | 0.2 | Nutrients | Livestock/Simmons |
| 0737 Cedar Creek | Callaway | 2 | pH, sulfate | Cedar Creek AML |
| | | 1 | Sulfate | Cedar Creek AML |
| | | 1 | Sulfate | Manacle, Cross- |
| Mitchell AMLs | | | | |
| 3203 Center Creek | Jasper | 11 | Zinc | Tristate AML |
| 0640 Chariton River | Chariton | 29 | Fecal coliform | Unknown |
| 3168 Chat Creek | Lawrence | 2 | Zinc | Aurora AML |
| 3238 Clear Creek | Newton | 1 | BOD, NFR, NH ₃ N | Monett WWTP |
| 3239 Clear Creek | Barry/Lawrence | 2 | BOD, NFR, NH ₃ N | Monett WWTP |
| 0690 Dark Creek | Randolph | 8 | Sulfate | Crutchfield AML |
| 0912 Davis Creek | Lafayette | 2 | BOD, Nutrients | Odessa SE WWTP |
| 0510 Dog Creek | Daviess | 0.2 | Sediment | Traeger Quarry |
| 1145 Dry Auglaize Creek | Laclede | 1.5 | BOD, NFR | Lebanon WWTP |
| 2604 Eleven Point River | Howell | 0.4 | Chlorine | Willow Springs |
| WWTP | | | | |
| 3246 Elk River | McDonald | 21.5 | Nutrients | Livestock production |
| 2168 Flat River Creek | St. Francis | 5 | Lead, sediment, zinc | Old Lead Belt AML |
| 2860 Goose Creek | Madison | 0.5 | Nickel | Madison mine outflow |
| 0883 Gabriel Creek | Morgan | 1.1 | BOD, NFR | Stover NW WWTP, |
| Stover SW WWTP | | | | |
| 1007 Hinkson Creek | Boone | 6 | Unspecified | Urban nonpoint source |
| 1008 Hinkson Creek | Boone | 5 | Unspecified | Urban nonpoint source |
| 1251 Honey Creek | Henry | 3 | Sulfate | Reliant AML |
| 2582 Howell Creek | Howell | 0.3 | Chlorine | West Plains WWTP |
| 3256 Indian Creek | McDonald/Newton | 26 | Nutrients | Livestock production |

| Water | County | Miles/Acres Affected*** | Pollutant | Source |
|-------------------------------|----------------------------|----------------------------|--------------------------------|------------------------------------|
| <u>Streams/Rivers (cont.)</u> | | | | |
| 3262, 3263 M. Indian Cr. | Newton | 5.5 | Nutrients | Livestock production |
| 3260 N. Indian Creek | Newton | 5 | Nutrients | Livestock production |
| 3259 S. Indian Creek | Newton | 9 | Nutrients | Livestock production |
| 2681 Jacks Fork River | Shannon | 5 | Fecal coliform | Organic wastes |
| 2347, 2362, 2365 James River | Greene/Stone/ Christian | 58.5 | Nutrients, unknown | Urban point & nonpoint source |
| 1016 Kelley Branch | Boone | 1 | Habitat loss | ORV use Finger Lakes State Park |
| 1438 Little Lindley Creek | Dallas | 1 | BOD, NFR | Buffalo WWTP |
| 0427 E. Fk. Little Blue R. | Jackson | 0.1 | BOD, NFR | Independence MHP |
| 0535 Long Creek | Caldwell | 0.2 | Sediment | Everett #6 Quarry |
| 2814 Main Ditch | Butler | 5 | BOD, NFR | Poplar Bluff WWTP |
| 0742 Manacle Creek | Callaway | 2 | pH, sulfate | Manacle Creek AML |
| 1308 Marmaton River | Vernon | 49.5 | Not stated | Natural background |
| 2787 McKenzie Creek | Wayne | 0.5 | pH | Gads Hill Quarry |
| 1234 Monegaw Creek | St. Clair | 3 | Sulfate | Montee AML |
| 0942 N. Moreau Creek | Moniteau | 10 | Susp. Algae | California S. WWTP |
| 1300 Mound Branch | Bates | 1 | BOD | Butler WWTP |
| 0856 L. Muddy Creek | Pettis | 0.7 | Temperature | Tyson's Foods Inc. |
| 0855 Muddy Creek | Pettis | 33 | BOD | Sedalia Central WWTP |
| 3490 Trib. L. Muddy Creek | Pettis | 0.4 | Temperature, NH ₃ N | Tyson's Foods Inc. |
| 1305 Mulberry Creek | Bates | 8 | Sulfate | Mulberry Creek AML |
| 3652 Little Osage River | Vernon | 16 | Not stated | Natural background |
| 1310 Little Osage River | Vernon | 6.3 | Not stated | Natural background |
| 1031 Osage River | Miller/Cole | 0.4 | Habitat loss | Capital Sand&Gravel, Osage S&G |
| 3268 Patterson Creek | McDonald | 2 | Nutrients | Livestock production |
| 2373 Pearson Creek | Greene | 1.5 | Unknown toxicity | Unknown |
| 2614 Piney Creek | Oregon | 0.1 | Chlorine | Alton WWTP |
| 1714 Rock Creek | Jefferson | 2 | BOD, NH ₃ N | 2 WWTPs |
| 1014 Rocky Fork | Boone | 0.5 | Sediment | Finger Lakes AML |
| 0278 Rush Cr. | Platte | 0.2 | BOD, NFR | Platte Co. Sewer Dist. #7 WWTP |
| 1381 L. Sac River | Greene/Polk | 27 | Fecal coliform | Springfield NW WWTP |
| 2859 Saline Creek | Madison | 0.5 | Nickel | Madison mine outflow |
| 2190 Saline Creek | Jefferson | 2 | BOD, NH ₃ N | Ron Rog WWTP, Hwy 141 WWTP |
| 0091 Salt River | Ralls | 29 | Manganese,Iron,Low D.O. | Cannon Dam |
| 0103 Salt River | Ralls/Pike | 10 | Low D.O., Manganese | Cannon Dam |
| 1319 Second Nicholson Creek | Barton | 3 | Sulfate | Many AML areas |
| 2170 Shaw Branch | St. Francis | 2 | Sediment | Federal AML |
| 2120 Shibboleth Creek | Washington | 0.5 | Sediment | Barite tailings pond |
| 3230 Shoal Creek | Barry/Newton | 13.5 | Fecal coliform | Unknown ag. sources |
| 0400 W. Fk. Sni-a-Bar Cr. | Jackson | 0.2 | BOD, NFR | Lake Lotawana WWTP |
| 2835 St. Francis River | St. Francis | 3 | NH ₃ N, BOD | Farmington W. WWTP |
| 1361 Stockton Branch | Cedar | 2 | Susp. Algae | Stockton WWTP |
| 0959 Straight Fork | Morgan | 2 | Susp. Algae | Versailles WWTP |
| 3250 B. Sugar Creek | McDonald/Barry | 31 | Nutrients | Livestock production |

| Water | County | Miles/Acres Affected*** | Pollutant | Source |
|---|------------------|----------------------------|--|--|
| <u>Streams/Rivers (cont.)</u> | | | | |
| 3249 L. Sugar Creek | McDonald | 11 | Nutrients | Livestock production |
| 0686 Sugar Creek | Randolph | 1 | pH | Huntsville AML |
| | | 0.5 | pH | Calfee Mine Flow |
| 1282 E. Fk. Tebo Creek | Henry | 1 | pH | Triple Tipple AML |
| 1284 M. Fk. Tebo Creek | Henry | 5.5 | Sulfate | Newcastle Tipple AML, |
| | | | other AML | |
| 1288 M. Fk. Tebo Creek | Henry | 2 | pH, sulfate | Newcastle Tipple AML |
| | | 1.5 | Sulfate | Newcastle Tipple AML |
| 1292 W. Fk. Tebo Creek | Henry | 7 | Sulfate | Spargler AML |
| 2850 Trace Creek | Madison | 4.2 | pH | Unknown |
| | | 1.3 | pH | Unknown, sawdust pile |
| leachate | | | | |
| 1211 Trib. Barker's Creek | Henry | 0.3 | pH, sulfate | Grey AML |
| 1225 Trib. Big Otter Creek | Henry/St. Clair | 1 | pH | Otter Creek AML |
| 2128 Trib. Pond Creek | Washington | 0.5 | Sediment | Barite tailings pond |
| 3217 Turkey Creek | Jasper | 5 | Zinc | Duenweg AML |
| 3216 Turkey Creek | Jasper | 3.5 | Zinc | Duenweg AML |
| | | 4 | PCP | Joplin Turkey Crk WWTP |
| | | 4 | BOD, NFR | Joplin Turkey Crk WWTP |
| 3282 Turkey Creek | St. Francis | 1.5 | BOD, NFR | Bonne Terre WWTP |
| 2864 Village Creek | Madison | 0.5 | Sediment | Mine la Motte AML |
| 1505 Whetstone Creek | Wright | 2 | BOD | 2 Mountain Grove WWTPs |
| 2375 Wilson Creek | Greene/Christian | 18 | Unknown toxicity | Urban nonpoint source |
| <u>Lakes</u> | | | | |
| 7119 Cameron Lower Lake production | DeKalb | 96 | Atrazine | Corn, sorghum |
| 7120 Cameron Lake #1 production | DeKalb | 25 | Atrazine | Corn, sorghum |
| 7121 Cameron Lake #2 production | DeKalb | 35 | Atrazine | Corn, sorghum |
| 7237 Fellows Lake source | Greene | 820 | Nutrients | Ag/suburban nonpoint |
| 7124 Hamilton Lake production | Caldwell | 80 | Cyanazine | Corn, sorghum |
| 7190 Higginsville S. Lake production | Lafayette | 223 | Atrazine | Corn, sorghum |
| 7022 LaBelle Lake #1 production | Lewis | 17 | Atrazine | Corn, sorghum |
| 7023 LaBelle Lake #2 production | Lewis | 112 | Atrazine | Corn, sorghum |
| 7205 Lake of the Ozarks | Benton | 50 | Low D.O. Gas supersaturation Fish trauma | Truman Dam Truman Dam Truman Dam |
| 7314 Lake Taneycomo | Taney | 1,730 | Low D.O. | Table Rock Dam |
| 7356 Lamar Lake | Barton | 180 | Nutrients | Ag nonpoint source |

| | | | | |
|-------------------------------|--------------|--------|-----------|-----------------------------|
| 7033 Mark Twain Lake | Ralls | 18,600 | Atrazine | Corn, sorghum production |
| 7236 McDaniel Lake | Greene | 300 | Nutrients | Ag/suburban nonpoint source |
| 7031 Monroe City Route J Lake | Ralls | 94 | Atrazine | Corn, sorghum production |
| | | | Cyanazine | Corn, sorghum production |
| 7187 Spring Fork Lake | Pettis | 178 | Algae | Ag nonpoint source |
| 7077 Smithville Lake | Clay | 7,190 | Atrazine | Corn, sorghum production |
| 7207 HS Truman Lake | Bates/Benton | 55,600 | Manganese | Natural |
| 7032 Vandalia Lake | Pike | 37 | Atrazine | Corn, sorghum production |

CATEGORY 2
RECOMMENDED SECTION 303(d) WATERS REQUIRED TO HAVE ADDITIONAL
MONITORING PRIOR TO TMDL DEVELOPMENT

| Water | County | Miles/Acres Affected*** | Pollutant | Source |
|--------------------------|-------------------------|----------------------------|--------------|--------------------|
| <u>Streams/Rivers</u> | | | | |
| 1250 Big Cr. | Cass/Henry | 49 | Sediment* | Ag nonpoint source |
| 0449 W. Fk. Big Cr. | Harrison | 18 | Sediment | Ag nonpoint source |
| 0436 Big Muddy Cr. | Daviess | 8 | Sediment *+ | Ag nonpoint source |
| 0653 Blackbird Cr. | Putnam/Adair | 10.5 | Sediment+ | Ag nonpoint source |
| 0921 S. Fk. Blackwater | Johnson | 5 | Sediment* | Ag nonpoint source |
| 1336 Clear Cr. | Vernon | 18 | Sediment+ | Ag nonpoint source |
| 0372 E. Fk. Crooked Cr. | Ray | 14 | Sediment | Ag nonpoint source |
| 1325 L. Drywood Cr. | Vernon | 17 | Sediment | Ag nonpoint source |
| 0189 Elkhorn Cr. | Montgomery | 0.5 | Sediment | Ag nonpoint source |
| 0056 N. Fabius R. | Marion/Schuyler | 82 | Sediment | Ag nonpoint source |
| 0865 Flat Cr. | Pettis | 20 | Sediment+ | Ag nonpoint source |
| 0457 E. Fk. Grand R. | Worth/Gentry | 25 | Sediment | Ag nonpoint source |
| 0468 M. Fk. Grand R. | Worth/Gentry | 25 | Sediment+ | Ag nonpoint source |
| 0502 Grindstone Cr. | Clinton/DeKalb | 16 | Sediment | Ag nonpoint source |
| 0337 Honey Cr. | Nodaway | 8.5 | Sediment | Ag nonpoint source |
| 0554 Honey Cr. | Livingston | 23 | Sediment | Ag nonpoint source |
| 0212 Indian Camp Cr. | Warren | 5 | Sediment | Ag nonpoint source |
| 0875 Lake Cr. | Pettis | 15 | Sediment | Ag nonpoint source |
| 3105 Lat.#2 Main Ditch | Stoddard | 11.5 | Sediment * | Ag nonpoint source |
| 0606 Locust Cr. | Putnam/Chariton | 84 | Sediment | Ag nonpoint source |
| 0612 W. Fk. Locust Cr. | Sullivan/Linn | 17 | Sediment+ | Ag nonpoint source |
| 0339 Long Branch | Nodaway | 6 | Sediment | Ag nonpoint source |
| 0508 Marrowbone Cr. | Daviess | 11 | Sediment | Ag nonpoint source |
| 0619 E. Fk. Medicine Cr. | Putnam/Grundy | 36 | Sediment *+ | Ag nonpoint source |
| 0623 L. Medicine Cr. | Mercer/Grundy | 40 | Sediment *+ | Ag nonpoint source |
| 1299 Miami Cr. | Bates | 18 | Sediment | Ag nonpoint source |
| 0159 Mill Creek | Lincoln | 4 | Sediment | Ag nonpoint source |
| 0001 Mississippi River | Clark-St. Charles | 165 | Habitat loss | Channelization |
| 1707 Mississippi River | St. Charles-Mississippi | 200.5 | Habitat loss | Channelization |
| 3152 Mississippi River | Mississippi-Pemiscot | 124.5 | Habitat loss | Channelization |
| 0226 Missouri River | Atchison-Jackson | 179 | Habitat loss | Channelization |
| 0356 Missouri River | Jackson-Chariton | 125 | Habitat loss | Channelization |
| 0701 Missouri River | Chariton-Gasconade | 129 | Habitat loss | Channelization |
| 1604 Missouri River | Gasconade-St. Charles | 100 | Habitat loss | Channelization |
| 0345 White Cloud Cr. | Andrew/Nodaway | 11 | Sediment | Ag nonpoint source |
| 0674 Mussel Fork | Sullivan/Macon | 29 | Sediment+ | Ag nonpoint source |
| 1175 W. Fk. Niangua R. | Webster | 0.5 | BOD,NFR | Marshfield WWTP |
| 0081 North R. | Marion/Shelby | 40 | Sediment | Ag nonpoint source |
| 3041 Old Ch. Little R. | New Madrid | 20 | Sediment * | Ag nonpoint source |
| | | 3.5 | Sediment | Ag nonpoint source |
| 1444 Piper Cr. | Polk | 0.5 | NFR | Bolivar WWTP |
| 0327 3rd Fk. Platte R. | Gentry/Buchanan | 31.5 | Sediment | Ag nonpoint source |
| 0121 M. Fk. Salt R. | Monroe/Macon | 49 | Sediment | Ag nonpoint source |
| 3134 Spillway Ditch | Mississippi/NewMadrid | 13.5 | Sediment* | Ag nonpoint source |
| 0657 Spring Cr. | Sullivan/Adair | 18 | Sediment+ | Ag nonpoint source |

| Water | County | Miles/Acres Affected*** | Pollutant | Source |
|-------------------------------|----------------|------------------------------------|-----------------------------|----------------------|
| <u>Streams/Rivers (cont.)</u> | | | | |
| 1870 Spring Cr. | Dent | 0.3 | BOD, NFR | Salem WWTP |
| 3188 N. Fk. Spring R. | Dade/Jasper | 51.5 | Sediment | Ag nonpoint source |
| 0710 Stinson Cr. | Callaway | 0.5 | BOD, NH ₃ N, NFR | Fulton WWTP |
| 0248 L. Tarkio Cr. | Holt | 17.5 | Sediment+ | Ag nonpoint source |
| 0073 Troublesome Cr. | Marion | 3.5 | Sediment+ | Ag nonpoint source |
| 1339 Walnut Cr. | Cedar | 1.0 | BOD,NFR | El Dorado Spgs. WWTP |
| 0050 S. Wyaconda R. | Clark/Scotland | 9.0 | Sediment+ | Ag nonpoint source |

Lakes

| | | | | |
|-----------------------|-------|------|-----------|--------------------------|
| 7171 Long Branch Lake | Macon | 2430 | Cyanazine | Corn, sorghum production |
| 7009 Wyaconda Lake | Clark | 8 | Atrazine | Corn, sorghum production |

* stream has significant amounts of channelization
+ large Concentrated Animal Feeding Operations in this watershed

CATEGORY 3 RECOMMENDED SECTION 303(d) WATERS REQUIRED TO HAVE USE ATTAINABILITY ANALYSES OR TMDL DEVELOPMENT

| Water | County | Miles/Acres Affected*** | Pollutant | Source |
|-----------------------|---------------|------------------------------------|------------------|------------------------|
| <u>Streams/Rivers</u> | | | | |
| 0417 Blue River | Jackson | 4 | Chlordane | Urban nonpoint sources |
| 0418 Blue River | Jackson | 9 | Chlordane | Urban nonpoint sources |
| 0419 Blue River | Jackson | 9 | Chlordane | Urban nonpoint sources |
| 0421 Blue River | Jackson | 2 | Chlordane | Urban nonpoint sources |
| 0037 Fox River | Clark | 12 | Sediment | Ag nonpoint source |
| 0046 Wyaconda River | Lewis | 8 | Manganese | Natural |
| 0063 M. Fabius River | Lewis | 57 | Manganese | Natural |

Lakes

| | | | | |
|-------------------------|--------------|--------|-----------|-----------------------|
| 7255 Creve Coeur Lake | St. Louis | 300 | Chlordane | Urban nonpoint source |
| 7054 Lake St. Louis | St. Charles | 525 | Chlordane | Urban nonpoint source |
| 7211 Pleasant Hill Lake | Cass | 115 | Chlordane | Unknown |
| 7207 Truman Lake | Bates-Benton | 55,600 | Manganese | Natural |

Notes:

*** Units are in miles for streams and surface acres for lakes.

Abbreviations:

| | | | |
|-------------------|--------------------------|------|----------------------------|
| AML | Abandoned mined land | PCP | Pentachlorophenol |
| BOD | Biological oxygen demand | WWTP | Wastewater treatment plant |
| D.O. | Dissolved oxygen | | |
| NFR | Non-filterable residue | | |
| NH ₃ N | Ammonia | | |
| pH | Acidic conditions | | |

APPENDIX G

Streams Designated for Cold Water Fisheries

Streams Designated for Cool Water Fisheries

Outstanding National Resource Waters

Outstanding State Resource Waters

Table 20. WATER BODIES DESIGNATED FOR COLDWATER FISHERY

| Water body | Miles/Acres | | From | To | County(ies) |
|-----------------------|-------------|-----|----------------------|-------------------|---------------------|
| Barren Fork | 2.0 | mi. | Mouth | 20, 31N, 04W | Shannon |
| Bee Creek | 1.6 | mi. | Mouth | 17, 23N, 21W | Taney |
| Bender Creek | 0.7 | mi. | Mouth | 10, 31N, 09W | Texas |
| Bennett Springs Creek | 2.0 | mi. | Mouth | Bennett Springs | Laclede |
| Blue Springs Creek | 4.0 | mi. | Mouth | 02, 39N, 03W | Crawford |
| Bryant Creek | 1.0 | mi. | 03, 23N, 12W | 34, 24N, 12W | Ozark |
| Bryant Creek | 6.0 | mi. | 19, 27N, 14W | 08, 27N, 15W | Douglas |
| Buffalo Creek | 10.0 | mi. | State line | 05, 23N, 33W | McDonald |
| Bull Creek | 5.0 | mi. | Mouth | 34, 24N, 21W | Taney |
| Bull Shoals Lake | 9000.0 | ac. | 21 & 35, 20N, 15W | --- | Ozark |
| Capps Creek | 4.0 | mi. | Mouth | 17, 25N, 28W | Newton-Barry |
| Cedar Creek | 1.0 | mi. | 21, 26N, 32W | 28, 26N, 32W | Newton |
| Center Creek | 3.0 | mi. | 23, 27N, 29W | 17, 27N, 28W | Lawrence |
| Chesapeake Creek | 3.0 | mi. | Mouth | 29, 28N, 25W | Lawrence |
| Crane Creek | 15.0 | mi. | 08, 25N, 23W | 23, 26N, 25W | Stone-Lawrence |
| Current River | 19.0 | mi. | 24, 31N, 06W | Montauk Spring | Shannon-Dent |
| Dogwood Creek | 2.3 | mi. | Mouth | State line | Stone |
| Dry Creek | 4.0 | mi. | Mouth | 14, 37N, 03W | Crawford |
| Eleven Point River | 33.5 | mi. | State line | 36, 25N, 04W | Oregon |
| Flat Creek | 3.0 | mi. | 09, 23N, 27W | 21, 23N, 27W | Barry |
| Goose Creek | 4.0 | mi. | Mouth | 10, 28N, 25W | Lawrence |
| Greer Spring Branch | 1.0 | mi. | Mouth | 36, 25N, 04W | Oregon |
| Hickory Creek | 4.5 | mi. | 13, 25N, 31W | 28, 25N, 31W | Newton |
| Hobbs Hollow | 2.7 | mi. | Mouth | State line | Stone |
| Horse Creek | 2.2 | mi. | Mouth | 23, 35N, 8W | Dent |
| Hunter Creek | 5.0 | mi. | 22, 26N, 15W | 20, 26N, 14W | Douglas |
| Hurricane Creek | 1.5 | mi. | Mouth | 30, 24N, 12W | Ozark |
| Hurricane Creek | 3.2 | mi. | Mouth | 22, 25N, 03W | Oregon |
| Indian Creek | 20 | mi. | Mouth | 36, 39N, 01W | Franklin-Washington |
| Indian Creek | 1.4 | mi. | Mouth | 17, 21N, 23W | Stone |
| Johnson Creek | 3.0 | mi. | Mouth | 36, 29N, 26W | Lawrence |
| Joyce Creek | 1.0 | mi. | 17, 24N, 28W | 16, 24N, 28W | Barry |
| L. Flat Creek | 3.5 | mi. | Mouth | 25, 25N, 27W | Barry |
| L. Piney Creek | 15.0 | mi. | 25, 37N, 09W | 04, 35N, 08W | Phelps |
| L. Piney Creek | 4.0 | mi. | 04, 35N, 08W | 21, 35N, 08W | Phelps |
| L. Sinking Creek | 2.2 | mi. | Mouth | 33, 32N, 04W | Dent |
| Lyman Creek | 1.0 | mi. | Mouth | 30, 40N, 03W | Crawford |
| Maramec Spring Branch | 1.0 | mi. | Mouth | 01, 37N, 06W | Phelps |
| Meramec River | 10.0 | mi. | 22, 38N, 05W | Hwy. 8 | Crawford |
| Mill Creek | 1.5 | mi. | Mouth | 09, 36N, 18W | Dallas |
| Mill Creek | 5.0 | mi. | 29, 37N, 09W | Yelton Spring | Phelps |
| Mill Creek | 1.5 | mi. | Mouth | 11, 40N, 08W | Maries |
| N. Fork White River | 23.0 | mi. | 09, 22N, 12W | 34, 25N, 11W | Ozark |
| Niangua River | 6.0 | mi. | 11, 35N, 18W | Bennett Sp. Creek | Dallas |

| Water body | Miles/Acres | | From | To | County(ies) |
|-------------------------------------|-------------|-----|-----------------|--------------|-----------------|
| Parker Hollow | 2.0 | mi. | Mouth | 20, 32N, 06W | Dent |
| Roaring River | 7.0 | mi. | Mouth | 34, 22N, 27W | Barry |
| Roark Creek | 3.0 | mi. | Mouth | 36, 23N, 22W | Taney |
| Roubidoux Creek | 4.0 | mi. | Mouth | 25, 36N, 12W | Pulaski |
| S. Indian Creek | 9.0 | mi. | 24, 24N, 31W | 01, 23N, 30W | Newton-McDonald |
| Schafer Spring Creek | 2.0 | mi. | Mouth | 20, 32N, 06W | Dent |
| Shoal Creek | 1.0 | mi. | Mouth | 18, 41N, 17W | Morgan |
| Shoal Creek | 7.0 | mi. | 09, 25N, 29W | 16, 22N, 21W | Newton |
| Spring Branch | 1.0 | mi. | Mouth | 19, 41N, 17W | Morgan |
| Spring Creek | 6.5 | mi. | Mouth | 31, 35N, 09W | Phelps |
| Spring Creek | 2.5 | mi. | Mouth | 04, 41N, 02W | Franklin |
| Spring Creek | 5.5 | mi. | Mouth | 12, 26N, 24W | Stone |
| Spring Creek | 6.0 | mi. | Mouth | 06, 24N, 13W | Douglas-Ozark |
| Spring Creek | 2.5 | mi. | Mouth | 26, 25N, 11W | Douglas |
| Spring Creek | 5.0 | mi. | Mouth | 14, 23N, 11W | Ozark |
| Spring Creek | 4.0 | mi. | Mouth | 30, 25N, 04W | Oregon |
| Spring Hollow | 10.0 | mi. | Bennett Springs | 27, 34N, 17W | Laclede |
| Spring River | 11.2 | mi. | 13, 27N, 27W | 20, 26N, 26W | Lawrence |
| Stokes Lake #1 (Arrowhead Lakes) | 60 | ac. | 18, 23N, 08W | --- | Howell |
| Stokes Lake #2 (Arrowhead Lakes) | 80 | ac. | 11, 23N, 08W | --- | Howell |
| Stone Mill Spring Branch | 0.2 | mi. | Mouth | Spring | Pulaski |
| Taneycomo, Lake | 1730 | ac. | 08, 23N, 20W | --- | Taney |
| Terrell Creek | 2.0 | mi. | Mouth | 02, 27N, 23W | Christian |
| Tory Creek | 2.5 | mi. | Mouth | 27, 26N, 22W | Stone-Christian |
| Turkey Creek | 2.0 | mi. | Mouth | 16, 22N, 21W | Taney |
| Turkey Creek | 1.0 | mi. | Mouth | 17, 23N, 15W | Ozark |
| Turnback Creek | 14.0 | mi. | 35, 30N, 26W | 24, 28N, 25W | Dade-Lawrence |
| Warm Fork Spring River | 3.0 | mi. | 6, 22N, 5W | 30, 23N, 05W | Oregon |
| Whittenburg Creek | 2.5 | mi. | Mouth | Hwy. 8 | Crawford |
| Williams Creek | 1.0 | mi. | Mouth | 28, 28N, 27W | Lawrence |
| Woods Fork Bull Creek | 1.0 | mi. | 15, 25N, 21W | 15, 25N, 21W | Christian |
| Yadkin Creek | 3.0 | mi. | Mouth | 09, 37N, 04W | Crawford |
| Yankee Branch | 1.0 | mi. | Mouth | 10, 36N, 04W | Crawford |

Table 21. WATER BODIES DESIGNATED FOR COOL WATER FISHERY

| WATER BODY | CLASS | MILES | FROM | TO | COUNTY | COUNTY 2 |
|-----------------|-------|-------|--------------|--------------------|------------|------------|
| Bank Br. | C | 5.0 | Mouth | 35, 37N, 17W | Camden | |
| Barren Fk. | P | 6.0 | Mouth | 30, 39N, 13W | Miller | |
| Beaver Cr. | P | 22.0 | Mouth | 29, 30N, 12W | Wright | Texas |
| Beaver Cr. | P | 44.5 | Mouth | 23, 27N, 17W | Taney | Douglas |
| Bee Fk. | C | 8.5 | Mouth | 30, 32N, 01W | Reynolds | |
| Big Barren Cr. | C | 19.0 | Mouth | 32, 26N, 02W | Ripley | Carter |
| Big Buffalo Cr. | P | 6.0 | Mouth | 06, 41N, 19W | Benton | Morgan |
| Big Buffalo Cr. | C | 2.5 | 06, 41N, 19W | 12, 42N, 20W | Morgan | |
| Big Cr. | P | 32.0 | Mouth | 23, 33N, 03E | Wayne | Iron |
| Big Cr. | C | 27.0 | Mouth | 05, 29N, 08W | Shannon | Texas |
| Big Piney R. | P | 99.0 | Mouth | 16, 29N, 10W | Pulaski | Texas |
| Big R. | P | 53.0 | Mouth | Sur 3166, 40N, 03E | Jefferson | |
| Big Sugar Cr. | P | 31.0 | 34, 22N, 32W | 27, 21N, 29W | McDonald | Barry |
| Black R. | P | 35.0 | 16, 25N, 06E | Clearwater Dam | Butler | Wayne |
| Black R. | P | 26.0 | 07, 29N, 03E | 17, 32N, 02E | Reynolds | |
| Black R. | P | 45.0 | State Line | 16, 25N, 06E | Butler | |
| Bourbeuse R. | P | 132.0 | Mouth | 04, 39N, 06W | Franklin | Phelps |
| Bourbeuse R. | C | 9.0 | 04, 39N, 06W | 12, 38N, 07W | Phelps | |
| Brush Cr. | P | 11.5 | Mouth | 31, 36N, 24W | St. Clair | Polk |
| Brushy Fk. | C | 5.0 | Mouth | 12, 39N, 14W | Miller | |
| Bryant Cr. | P | 43.0 | 34, 24N, 12W | 17, 27N, 15W | Ozark | Douglas |
| Bryant Cr. | P | 13.5 | 05, 22N, 12W | 03, 23N, 12W | Ozark | Douglas |
| Buffalo Cr. | P | 5.5 | 05, 23N, 33W | 14, 24N, 33W | Newton | |
| Buffalo Cr. | P | 10.0 | State Line | 05, 23N, 33W | McDonald | |
| Bull Cr. | P | 17.5 | 34, 24N, 21W | 33, 26N, 20W | Taney | Christian |
| Butler Cr. | P | 3.5 | Mouth | State Line | McDonald | |
| Cane Cr. | P | 23.0 | 36, 23N, 05E | 05, 25N, 05E | Butler | |
| Cane Cr. | C | 15.0 | 05, 25N, 05E | 15, 26N, 03E | Butler | Carter |
| Cane Cr. | C | 3.0 | Mouth | 28, 23N, 18W | Taney | |
| Castor R. | P | 59.5 | 29, 29N, 09E | 19, 34N, 8E | Bollinger | Madison |
| Center Cr. | P | 26.0 | 14, 28N, 34W | 34, 28N, 31W | Jasper | |
| Clark Cr. | P | 10.0 | Mouth | 20, 29N, 04E | Wayne | |
| Cole Camp Cr. | P | 16.4 | Mouth | 07, 42N, 21W | Benton | |
| Courtois Cr. | P | 30.0 | Mouth | 17, 35N, 01W | Crawford | Washington |
| Courtois Cr. | C | 1.5 | 17, 35N, 01W | 21, 35N, 01W | Washington | Iron |
| Crooked Cr. | P | 18.0 | Mouth | 36, 35N, 04W | Crawford | Dent |
| Crooked Cr. | P | 3.5 | Mouth | 33, 35N, 02W | Crawford | |
| Current R. | P | 118.0 | State Line | 24, 31N, 06W | Ripley | Shannon |
| Deer Cr. | P | 11.7 | Mouth | 21, 39N, 20W | Benton | |
| Eleven Point R. | P | 19.0 | 36, 25N, 04W | 23, 25N, 06W | Oregon | |
| Eleven Point R. | P | 21.0 | State Line | 18, 24N, 02W | Oregon | |
| Eleven Point R. | C | 34.0 | 23, 25N, 06W | 33, 27N, 09W | Oregon | Howell |
| Elk R. | P | 21.5 | State Line | 34, 22N, 32W | McDonald | |
| Finley Cr. | P | 44.0 | Mouth | 19, 28N, 16W | Stone | Webster |
| Flat Cr. | P | 7.5 | 21, 23N, 27W | 23, 22N, 28W | Barry | |
| Flat Cr. | P | 39.0 | 28, 24N, 24W | 09, 23N, 27W | Stone | Barry |

| WATER BODY | CLASS | MILES | FROM | TO | COUNTY | COUNTY 2 |
|----------------------|-------|-------|--------------------|----------------------|------------|--------------|
| Fourche Cr. | P | 14.0 | State Line | 15, 23N, 01W | Ripley | |
| Gasconade R. | P | 249.0 | Mouth | 06, 29N, 14W | Gasconade | Wright |
| Greasy Cr. | P | 4.0 | Mouth | 31, 34N, 19W | Dallas | |
| Greasy Cr. | C | 10.5 | 31, 34N, 19W | 11, 32N, 20W | Dallas | |
| Heaths Cr. | P | 13.0 | Mouth | 27, 48N, 22W | Cooper | Pettis |
| Heaths Cr. | C | 10.0 | 27, 48N, 22W | 17, 47N, 22W | Pettis | |
| Hog Cr. | P | 4.5 | Mouth | 06, 29N, 09W | Texas | |
| Hogles Cr. | P | 20.7 | Mouth | 32, 38N, 23W | Benton | Hickory |
| Hogles Cr. | C | 7.4 | 32, 38N, 23W | 34, 37N, 23W | Hickory | |
| Huzzah Cr. | P | 34.0 | Mouth | 01, 34N, 03W | Crawford | Dent |
| Indian Cr. | P | 7.2 | Mouth | 21, 42N, 20W | Benton | |
| Indian Cr. | P | 26.0 | Mouth | 24, 24N, 31W | McDonald | Newton |
| Indian Cr. | C | 3.0 | 36, 39N, 01W | 08, 38N, 01E | Washington | |
| Jacks Fk. | P | 39.0 | Mouth | 29, 28N, 07W | Shannon | Texas |
| James R. | P | 28.0 | 10, 24N, 22W | 08, 26N, 22W | Stone | |
| James R. | P | 26.0 | 08, 26N, 22W | Lake Springfield Dam | Stone | Greene |
| James R. | P | 35.0 | Hwy. 65 | 24, 29N, 17W | Greene | Webster |
| Jones Cr. | P | 7.0 | Mouth | 30, 27N, 30W | Jasper | Newton |
| L. Black R. | P | 16.0 | 31, 24N, 05E | 09, 24N, 03E | Butler | Ripley |
| L. Maries Cr. | P | 7.0 | Mouth | 24, 42N, 11W | Osage | |
| L. N. Fk. White R. | P | 5.0 | Mouth | 36, 24N, 16W | Ozark | |
| L. N. Fk. White R. | C | 6.0 | 36, 24N, 16W | 03, 24N, 16W | Ozark | |
| L. Niangua R. | P | 43.0 | Mouth | 26, 36N, 19W | Camden | Dallas |
| L. Piney Cr. | P | 6.0 | Mouth | 25, 37N, 09W | Phelps | |
| L. Pomme de Terre R. | C | 7.0 | Mouth | 22, 38N, 23W | Benton | Hickory |
| L. Sac R. | P | 29.0 | Mouth | McDaniel Lake Dam | Polk | Greene |
| L. St. Francis R. | P | 27.7 | Mouth | 32, 35N, 07E | Madison | St. Francois |
| L. Sugar Cr. | P | 11.0 | 34, 22N, 32W | State Line | McDonald | |
| L. Tavern Cr. | C | 4.0 | Mouth | 34, 42N, 13W | Miller | Cole |
| L. Weaubleau Cr. | P | 5.7 | Mouth | 09, 36N, 23W | St. Clair | Hickory |
| Lake Cr. | P | 4.3 | Mouth | 12, 44N, 20W | Pettis | Morgan |
| Lake Cr. | C | 9.7 | 12, 44N, 20W | 17, 43N, 20W | Pettis | Benton |
| Limestone Cr. | P | 7.0 | Mouth | 24, 30N, 27W | Dade | |
| Lost Cr. | P | 7.0 | Mouth | 15, 46N, 03W | Warren | |
| Lost Cr. | P | 8.5 | State Line | 14, 25N, 33W | Newton | |
| Mahans Cr. | P | 4.0 | Mouth | 09, 28N, 04W | Shannon | |
| Marble Cr. | P | 14.5 | Mouth | 29, 33N, 04E | Madison | Iron |
| Maries R. | P | 41.5 | Mouth | 24, 40N, 10W | Osage | Maries |
| Meramec R. | P | 10.0 | 22, 38N, 05W | Hwy. 8 | Crawford | |
| Meramec R. | P | 37.0 | Big R. | Meramec State Park | Jefferson | Franklin |
| Meramec R. | P | 26.0 | Hwy. 141 | Big R. | St. Louis | Jefferson |
| Meramec R. | P | 35.0 | Hwy. 8 | Hwy. 72 | Crawford | Dent |
| Meramec R. | P | 75.0 | Meramec State Park | 22, 38N, 05W | Franklin | Crawford |
| Meramec R. | C | 4.0 | Hwy. 72 | 33, 34N, 04W | Dent | |
| Middle Fk. Black R. | P | 15.0 | Mouth | 24, 34N, 01W | Reynolds | Iron |
| Middle Fk. Black R. | C | 1.0 | 24, 34N, 01W | 13, 34N, 01W | Iron | |
| Mill Cr. | P | 6.2 | Mouth | 09, 37N, 21W | Hickory | |
| Mill Cr. | C | 2.8 | 09, 37N, 21W | 15, 37N, 21W | Hickory | |

| WATER BODY | CLASS | MILES | FROM | TO | COUNTY | COUNTY 2 |
|--------------------|-------|-------|--------------------|--------------------|----------------|--------------|
| Mineral Fk. | P | 15.0 | Mouth | 07, 38N, 02E | Washington | |
| N. Fk. White R. | P | 28.0 | 34, 25N, 11W | 17, 27N, 11W | Douglas | |
| Niangua R. | P | 6.0 | 11, 35N, 18W | Bennett Spring Cr. | Dallas | |
| Niangua R. | P | 51.0 | Bennett Spring Cr. | 33, 32N, 18W | Dallas | Webster |
| Niangua R. | P | 24.0 | Dallas County Line | 11, 35N, 18W | Dallas | |
| Osage Fk. | P | 69.0 | Mouth | 26, 30N, 17W | Laclede | Webster |
| Peno Cr. | C | 11.0 | Mouth | 32, 54N, 03W | Pike | |
| Pike Cr. | P | 3.0 | Mouth | 34, 27N, 01W | Carter | |
| Pomme de Terre R. | P | 21.0 | Mouth | Pomme de Terre Dam | Hickory | |
| Roubidoux Cr. | P | 18.0 | 11, 34N, 12W | 04, 31N, 11W | Pulaski | Texas |
| Roubidoux Cr. | C | 20.0 | 25, 36N, 12W | 11, 34N, 12W | Pulaski | |
| S. Fk. Buffalo Cr. | P | 2.0 | 20, 24N, 01E | 30, 24N, 01E | Ripley | |
| S. Fk. Buffalo Cr. | C | 4.0 | 30, 24N, 01E | 34, 24N, 01W | Ripley | |
| S. Fk. Saline Cr. | P | 20.5 | Mouth | 28, 35N, 09E | Perry | |
| Saline Cr. | P | 12.0 | 13, 36N, 09E | 16, 35N, 08E | Ste. Genevieve | |
| Shoal Cr. | P | 13.5 | Capps Cr. | 12, 23N, 28W | Newton | Barry |
| Shoal Cr. | P | 43.5 | State Line | 10, 25N, 29W | Newton | |
| Sinking Cr. | P | 21.0 | Mouth | 08, 32N, 03W | Shannon | Dent |
| Spring R. | P | 0.5 | 22, 28N, 34W | 15, 28N, 34W | Jasper | |
| Spring R. | P | 58.5 | State Line | 20, 28N, 27W | Jasper | Lawrence |
| St. Francis R. | P | 86.0 | Sur 727, 28N, 05E | 16, 35N, 04E | Wayne | St. Francois |
| Starks Cr. | P | 11.5 | Mouth | 12, 37N, 21W | Hickory | |
| Starks Cr. | C | 3.0 | 12, 37N, 21W | 31, 37N, 20W | Hickory | |
| Stouts Cr. | P | 9.0 | Mouth | 33, 24N, 04E | Madison | Iron |
| Strother Cr. | P | 7.0 | Mouth | 33, 34N, 01W | Reynolds | Iron |
| Sugar Cr. | P | 8.8 | Mouth | 23, 41N, 11W | Miller | Maries |
| Swan Cr. | P | 29.5 | Mouth | 04, 26N, 18W | Taney | Christian |
| Tavern Cr. | P | 37.0 | Mouth | 05, 38N, 12W | Miller | |
| Tavern Cr. | C | 8.0 | 05, 38N, 12W | 12, 37N, 13W | Miller | Pulaski |
| Terre Bleue Cr. | P | 4.5 | Mouth | Sur 2107, 37N, 05E | St. Francois | |
| Trace Cr. | P | 4.0 | Mouth | 04, 30N, 08E | Wayne | Bollinger |
| Turkey Cr. | P | 16.2 | Mouth | 05, 38N, 21W | Benton | |
| Twelve Mile Cr. | P | 7.5 | Mouth | 12, 31N, 06E | Madison | |
| Twelve Mile Cr. | C | 6.0 | 12, 31N, 06E | 17, 32N, 07E | Madison | |
| W. Fk. Black R. | P | 31.7 | Mouth | 25, 33N, 03W | Reynolds | |
| W. Fk. Fourche Cr. | P | 9.0 | Mouth | 15, 22N, 01W | Ripley | |
| W. Fk. Fourche Cr. | C | 2.0 | 15, 22N, 01W | Hwy. 142 | Ripley | |
| Whetstone Cr. | P | 13.0 | Mouth | 21, 29N, 13W | Wright | |
| Whitewater R. | P | 14.0 | 30, 33N, 11E | 29, 34N, 09E | Bollinger | Perry |
| Williams Cr. | P | 5.0 | Mouth | 11, 42N, 21W | Benton | |

Table 22. OUTSTANDING NATIONAL RESOURCE WATERS

| Stream | Location |
|--------------------|--|
| Current River | Headwaters to Northern Ripley Co. Line |
| Jacks Fork River | Headwaters to Mouth |
| Eleven Point River | Headwaters to Hwy. 142 |

Table 23. OUTSTANDING STATE RESOURCE WATERS

| Waterbody | Miles/Acres | | Location | County(ies) |
|---|--------------------|-----|--|--------------------|
| Baker Branch | 4.0 | mi. | Taberville Prairie | St. Clair |
| Bass Creek | 1.0 | mi. | Three Creek Conservation Area | Boone |
| Big Buffalo Creek | 1.5 | mi. | Big Buffalo Creek Conservation Area | Benton-Morgan |
| Big Creek | 5.3 | mi. | Sam A. Baker State Park | Wayne |
| Big Sugar Creek | 7.0 | mi. | Cuivre River State Park | Lincoln |
| Big Lake Marsh | 150.0 | ac. | Big Lake State Park | Holt |
| Blue Springs Creek | 4.0 | mi. | Blue Spring Creek Conservation Area | Crawford |
| Bonne Femme Creek | 2.0 | mi. | Three Creeks Conservation Area | Boone |
| Bull Creek | 8.0 | mi. | Mark Twain National Forest | Christian |
| Brush Creek | 0.7 | mi. | Bonanza Conservation Area | Caldwell |
| Bryant Creek | 1.5 | mi. | Bryant Creek Natural Area in Rippee Conservation Area | Ozark-Douglas |
| Cathedral Cave Branch | 5.0 | mi. | Onondaga Cave State Park | Crawford |
| Chariton River | 9.8 | mi. | Rebels Cove Conservation Area | Putnam-Schuyler |
| Chloe Lowry Marsh | 40.0 | ac. | Chloe Lowry Marsh Conservation Area | Mercer |
| Coakley Hollow | 1.5 | mi. | Lake of the Ozarks State Park | Camden |
| Coonville Creek | 2.0 | mi. | St. Francois State Park | St. Francois |
| Courtois Creek | 12.0 | mi. | Mouth to Hwy. 8 | Crawford |
| Crabapple Creek | 1.0 | mi. | Bonanza Conservation Area | Caldwell |
| Devils Ice Box Cave Branch | 1.5 | mi. | Rock Bridge State Park | Boone |
| East Fork Black River | 3.0 | mi. | Johnson's Shut-Ins State Park | Reynolds |
| First Nicholson Creek (East Drywood Creek) | 2.0 | mi. | Prairie State Park | Barton |
| Gan's Creek | 3.0 | mi. | Rock Bridge State Park | Boone |
| Huzzah Creek | 6.0 | mi. | Mouth to Hwy 8. | Crawford |
| Indian Creek | 17.5 | mi. | Mark Twain National Forest | Douglas-Howell |
| Ketchum Hollow | 1.5 | mi. | Roaring River State Park | Barry |
| Little Piney Creek | 25.0 | mi. | Mouth to 21,35N,08W | Phelps |
| Little Black River | 3.0 | mi. | Mud Puppy Natural History Area S22,T24N,R3E to S25,T24N,R3E | Ripley |
| Log Creek | 0.4 | mi. | Bonanza Conservation Area | Caldwell |
| Meramec River | 8.0 | mi. | Adjacent to Meramac State Park | Crawford-Franklin |
| Meramec River | 3.0 | mi. | Adjacent to Onondaga and Huzzah State Forest | Crawford |
| Mill Creek | 5.0 | mi. | Mark Twain National Forest | Phelps |
| N. Fk. White River | 5.5 | mi. | Mark Twain National Forest | Ozark |
| Noblett Creek | 5.0 | mi. | Above Noblett Lake, Mark Twain National Forest | Douglas-Howell |
| Onondaga Cave Branch | 0.6 | mi. | Onondaga Cave State Park | Crawford |

| Waterbody | Miles/Acres | | Location | County(ies) |
|-------------------------|--------------------|-----|--|--------------------|
| Pickle Creek | 3.0 | mi. | Hawn State Park | Ste. Genevieve |
| S. Prong L. Black River | 2.0 | mi. | Little Black Conservation Area | Ripley |
| Shoal Creek | 0.5 | mi. | Bonanza Conservation Area | Caldwell |
| Spring Creek | 17.0 | mi. | Mark Twain National Forest | Douglas |
| Spring Creek | 6.5 | mi. | Mark Twain National Forest | Phelps |
| Taum Sauk Creek | 5.5 | mi. | Johnson's Shut-Ins State Park Addition S23,T33N,R2E to S5,T33N,R3E | Reynolds-Iron |
| Turkey Creek | 4.6 | mi. | Three Creeks Conservation Area | Boone |
| Van Meter Marsh | 80.0 | ac. | Van Meter State Park | Saline |
| Whetstone Creek | 5.1 | mi. | Whetstone Creek Conservation Area | Callaway |

***Source for all tables in this appendix is 10 CSR 20-7.031, Water Quality Standards**

APPENDIX H

Waterbodies with Water Quality Problems Not Quite Severe Enough to be Placed on the 303(d) List

Waterbodies with Water Quality Problems not Quite Severe Enough to be Placed on 303(d) List

1. Waterbodies designated as drinking water supply sources with long term average atrazine raw and or finished water atrazine concentrations above 2.00 ug/l or cyanazine concentrations above 0.75 ug/l.

| | | |
|--------------------------|----------|--------------------------|
| Schuyler Co. PWSD#1 Res. | Atrazine | Corn, sorghum production |
| Unionville Reservoirs | Atrazine | Corn, sorghum production |
| Monroe City South Res. | Atrazine | Corn, sorghum production |
| Lake Thunderhead | Atrazine | Corn, sorghum production |

| | | |
|------------------------|---------------------|--------------------------|
| Marceline Reservoirs | Atrazine | Corn, sorghum production |
| Edina Reservoir | Atrazine, Cyanazine | Corn, sorghum production |
| Pape Res. (Concordia) | Atrazine | Corn, sorghum production |
| Breckenridge Reservoir | Atrazine | Corn, sorghum production |
| Adrian Reservoir | Cyanazine | Corn, sorghum production |

| | | |
|---------------------------|----------|--------------------------|
| Sugar Creek Res.(Moberly) | Atrazine | Corn, sorghum production |
|---------------------------|----------|--------------------------|

2. Waterbodies designated as drinking water supply sources which have long term average summer Chlorophyll-a concentrations above 40 ug/l. We consider these reservoirs to be at the greatest risk for chronic taste and odor problems in finished drinking water.

Marceline Reservoirs
Maysville Reservoirs

Note: Two other general categories of waterbodies might be considered for this list as a method of giving them the high priority they deserve: 1) streams draining areas with large confined animal populations, particularly if there is instream evidence of impact such as elevated concentrations of nitrate, 2) streams subjected to substantial physical alteration due to urbanization or other land use change.

*Source: John Ford, DNR-WPCP

APPENDIX I

Watershed Implementation

WATERSHED IMPLEMENTATION

Introduction

The term *watershed* refers to a geographic area in which water, sediments, and dissolved materials drain to a common outlet. This area is also called the drainage basin of the receiving waterbody. However, when working on an area for the protection of water quality, local decisions on the scale of geographic unit consider many factors, including the ecological structure of the basin, the hydrologic factors of underlying ground waters, the economic uses, the type and scope of pollution problems, and the level of resources available for protection and restoration projects. The waterbody/watershed is a functioning unit with interacting biological, physical, chemical and human components. If a waterbody suffers from problems often the cause of the problem can be linked to a source or sources within the watershed. In order for a water quality project to be successful it must take into account all factors of the watershed: local support, land use and potential for success.

Development and implementation of a consistent, coordinated and integrated process to guide watershed-based resource planning and management to protect, enhance and restore the state's watershed ecosystems to the benefit of all Missourians is the goal. The process involves local, state, federal and private land and water managers and interested citizens. A detailed discussion of watershed implementation assistance programs can be found in Appendix J.

Mark Twain Watershed Project (completed in 1997)

Management of the project was directed out of the Macon Water Quality Project Office and by the Natural Resources Conservation Service (NRCS) State Office. Technical specialists from the NRCS State Office, the University of Missouri Columbia (UMC), Extension Service (ES), Missouri Department of Natural Resources (DNR) and Missouri Department of Conservation (MDC) were also available to provide technical expertise. The project funds supported technical assistance personnel above the customary staffing level and water quality monitoring.

The Mark Twain project was located in northeast Missouri. The area, approximately 630 square miles (404,800 acres), included all of the drainage area of the Crooked, Otter and North Fork tributaries located within the hydrologic or political boundaries of Knox, Monroe and Shelby counties that empty into Mark Twain Lake. Upland and bottomlands of the basin are intensively cropped. Agricultural land comprises 55 percent of the project area's land use and is the number one industry in the basin. Soybeans, corn, wheat and other feed grains and forage crops are the major crops grown in the basin, and agricultural chemicals and pesticides are used extensively.

The basin is also a major hog producing region, with Shelby and Monroe Counties in the top ten of hog producing counties in Missouri. More than 300 swine facilities were in operation with an additional 100 dairy and beef operations in existence during the project. Animal waste produced has a human population equivalent of 144,500.

Soil erosion and rainfall runoff are the major hazards on about 80% of the cropland and pasture in the project area. Sediments are a problem, in that, they carry nutrients and chemicals attached to the clay/silt fractions that are deposited in the lakes and stream courses of the project area.

Project goals were to demonstrate and evaluate the effectiveness of total resource management plans (TRMP's) in addressing the resource problems within the area and provide technical assistance for the installation of animal waste systems. Plans utilizing an interdisciplinary team were developed and installed to assist in reducing the quantities of sediment and chemical pollutants (nutrients and pesticides) entering the water body system and being deposited in public drinking water supply reservoirs within the project area and to Mark Twain Lake at the mouth of the project area. Another major goal was to finalize the training of 16 NRCS field personnel in the formulation and implementation of nutrient/pesticides strategies, as part of the TRMP process. Three areas of training needed by NRCS personnel included crop/nutrient, soil fertility, and integrated pest management. The training was accomplished utilizing existing Extension In-service Education (ISE) programs, Certified Crop Advisory (CCA) classes, and Integrated Crop Management (ICM) course curriculum. This gave NRCS the base of expertise necessary to provide additional training to field personnel throughout the state for future planning activities.

Evaluation of project activities was accomplished by periodic meetings of the training advisory committee, and local, state, and private industry participants. Educational/informational needs, cooperator recruitment, and the monitoring program were reviewed, evaluated, and revisions made as necessary. A final report to DNR summarizes project accomplishments and revisions necessary to meet project objectives.

Project Period: January 1, 1993--December 31, 1997

Sponsor: USDA-Natural Resources Conservation Service

| | | |
|----------|------------------|-----------|
| Funding: | EPA/DNR | \$585,200 |
| | Nonfederal match | \$478,800 |

Contact: The Mark Twain Water Quality Initiative
28898 US Highway 63
Macon, MO 63552-9587
Telephone: (816) 385-6359

Upper Shoal Creek Watershed (completed in 2000) **Poultry Litter/Nutrient Management Demonstration**

The Poultry Litter/Nutrient Management Demonstration Project supported technical assistance for the Southwest Missouri Resource Conservation and Development, Inc. (RC&D) office to provide a nutrient management specialist in the Upper Shoal Creek watershed. The specialist was employed by the Southwest Missouri RC&D and stationed in the Barry County Soil and Water Conservation District (SWCD) in Cassville, MO.

Further down in its watershed, Shoal Creek supplies drinking water for 10,000 people in Neosho and 45,000 in Joplin.

The 59,400-acre Upper Shoal Creek watershed is located in Barry and Newton Counties in southwest Missouri. Land use in the watershed was estimated to be 73 percent grassland, 20 percent forest land, 5 percent other (water, roads, farmsteads) and 2 percent cropland. Many poultry companies have facilities in this watershed. Annual poultry production in southwest Missouri was about 190 million broilers and 20 million turkeys at the time of the project. This production generated approximately 465,000 tons of litter per year. Broiler production is increasing annually.

Excessive nutrients are potential problems to the tributaries, springs and groundwater resources of Southwest Missouri and its downstream neighbors. Nutrient sources in the Upper Shoal Creek watershed included municipal wastes, livestock and poultry wastes and fertilization. Water quality data for the nearby Elk River showed increasing levels of nitrogen and bacteria in streams over time, believed to be due primarily by land application of animal wastes. Monitoring of water quality in Shoal Creek suggested it is also affected by land application of animal waste.

Protection of the drinking water supply by controlling (karst terrain) groundwater infiltration and surface runoff to reduce nutrient delivery and control soil erosion were the two major issues to be addressed in the management of poultry production lands draining into Upper Shoal Creek. Consideration was also given to the federally threatened, state-endangered Ozark Cavefish, the state-endangered Little Purple Mussel and a variety of other animals and plants on the state-listed watch list in this watershed.

Sponsor objectives were: (1) to provide direct technical assistance to producers in the project area to plan and implement nutrient management plans for reducing and controlling nutrients (promoting appropriate poultry litter land application rates) in the project area; (2) to monitor nutrients (N, P, K) in soils, streams, springs, ponds and wells at selected demonstration sites; (3) to monitor land use in relationship to long-term management practices; 4) to use results of the project to evaluate guidelines for poultry litter nutrient applications; and 5) to reduce and control nutrient concentrations leaving the fields in surface runoff or by leaching to the groundwater resource.

Project Period: 1995--2000

Sponsor: Southwest Missouri RC&D Council, Inc.

| | | |
|----------|------------------|-----------|
| Funding: | EPA/DNR | \$378,700 |
| | Nonfederal match | \$309,845 |

Contact: Rita Mueller
Southwest Missouri RC&D Council, Inc./Barry Co. SWCD
Plaza Southwest Center, Suite 301C
West Highway 60
Republic, MO 65738
(417) 732-6485

Loose Creek Water Quality Initiative Project (completed in 2000)

The Loose Creek Water Quality Initiative Project supported technical assistance, animal waste handling equipment and construction for the Osage County Soil and Water Conservation District (SWCD) to demonstrate, develop, and implement sound nutrient management practices in the watershed.

The Loose Creek watershed consists of approximately 45,000 acres (12% of county acreage), 19,200 acres of woodlands, 16,700 acres of pasture and hay ground, 5,900 acres of row crops and small grains, and 3,200 acres in cities, communities and home lots. The 248 farms in the watershed consist of 25 poultry producers (1,000,000 one-time capacity), 35 swine producers (40,000 head), 2 dairy operations (200 head) and 112 beef farms (5,600 head). Over the past two decades, confinement livestock production has increased significantly in Osage County. Swine and poultry producers have also intensified their production. In 1975, 500 plus farmers produced 48,500 head of swine while in 1991 slightly less than 300 farmers produced 92,600 head. Poultry production has intensified much the same way. In 1987, 43 turkey producers had a one-time capacity of 585,000 birds; when this project started, 25 producers had a one-time capacity of 1,000,000 birds. These operations produce approximately 45% of the swine and 75% of the poultry produced in the county. A relatively small percentage of the county's acreage is used to produce a large percentage of the swine and poultry. This situation concentrates animal wastes in a small segment of the county.

Animal waste management is a major resource concern in the Loose Creek watershed. More animal waste is generated on farms in the watershed than can be land applied under approved management plans utilizing current practices and technology. Topography, gently sloping to steep (2 - 35% slope), causes additional concern as the majority of the land available for a soil plant filter is greater than 10% slope, which has limited use for land application under current regulations. As of the project's beginning, only two swine operations in the watershed had an approved animal waste management system.

The overall objective of the project was to improve water quality through adoption by producers of sound nutrient management practices. This was achieved primarily through the proper handling and usage of waste generated by poultry, swine, dairy and beef operations. The project coordinator was the pivot point of all activities tied to this project. Assistance from other agencies included: (1) University of Missouri Extension, livestock specialist that provided expertise in livestock management; (2) An Extension ag engineer that provided assistance with system analysis, farmstead planning and land application of animal/poultry waste; (3) The Natural Resources Conservation Service (NRCS) did the technical design of animal waste facilities; (4) An Extension farm management specialist provided assistance to participating producers with economic analysis of proposed changes/systems prior to detailed design and construction; (5) An NRCS nutrient management specialist worked with a regional Extension agronomy specialist in advising producers on cropping systems related to animal waste and nutrient management; (6) A local field technician provided the necessary surveys and on-site work in support of the project. The NRCS engineer worked closely with the Extension engineer in the overall planning of facilities and provide the technical designs for proposed animal waste management facilities as required by the DNR for construction and acquisition of the necessary Letters of Approval.

Project Period: August 1, 1995--May 31, 2000

Sponsor: Osage County Soil and Water Conservation District

| | | |
|----------|------------------|-----------|
| Funding: | EPA/DNR | \$492,050 |
| | Nonfederal match | \$402,500 |

Contact: Osage County Soil and Water Conservation District
P. O. Box 588
Linn, MO 65051
Telephone: (573) 897-3797

Fellows/McDaniel Lakes Watershed (completed in 1998)

This project focused on the City of Springfield's two water supply reservoirs on the Little Sac River: McDaniel and Fellows Lakes. McDaniel Lake, completed in 1929, stored 1.46 billion gallons of water. Fellows Lake (1955), 3 miles upstream, stores 10.1 billion gallons. The combined watersheds of these reservoirs are about 39 square miles, (25,000 acres).

Both reservoirs have experienced nutrient inputs of concern to water supply personnel. Studies of the lakes over a five year period, 1983-1987 indicated that McDaniel Lake was moderately eutrophic and Fellows Lake was at the upper end of mesotrophic. A watershed study started in 1983 as a response to severe taste and odor problems in the water supply. These problems were related to algae blooms believed to have been stimulated by excessive nutrient input from the watersheds. Agriculture was then the predominant land use in the watershed.

This watershed project utilized a comprehensive approach to watershed management aimed at preventing further water quality degradation of these important drinking water sources. The two categories of nonpoint source pollution believed to constitute the greatest water quality threats at the time of the project were addressed - runoff from agricultural activities, primarily cattle operations; and septic tank leachate from systems in marginal sites and soils.

The outreach plan contained a video/slide presentation to document the monitoring, best management practices (BMPs) implementation and results from the agricultural runoff demonstration project. Also included were fact sheets on the BMPs. A practical guide to performing site evaluations for local inspectors, engineers, soil scientists and other persons who have a stake in the successful performance of on-site sewage systems is under development as well as video tapes/slide shows /brochures and technical sheets to be used as training tools on job site evaluations. A special plan was developed for monitoring on-site wastewater systems in karst terrain.

While this project agreement culminated, the demonstration, education and monitoring efforts are on-going. A summary follows. During the early years of the project a clean lakes study was also taking place on McDaniel Lake. Over the sampling period of the study the lake water quality showed improvement.

Project Period: 1992 - 1998

Sponsor: Watershed Committee of the Ozarks

Funding: EPA/DNR \$63,000
Nonfederal match \$56,000

Contact: Loring Bullard
Watershed Committee of the Ozarks
300 West Brower
Springfield, Missouri 65802-3817
(417) 866-1127

Project Summary

A study was implemented between 1982-1988 by City Utilities of Springfield. This study was prompted by taste and odor problems and subsequent public concern; the result of decaying algal blooms. Phosphorus, because of its role in algae production, was the main nutrient of study. The tributaries that exhibited the highest concentrations of phosphorus were those associated with dairy operations that had overgrazed slopes - the biggest contributor being a tributary (referred to as R-16) to the Little Sac River. R-16 has been extensively monitored ever since.

The steering committee for this project began in 1992. The committee consisted of representatives from City Utilities of Springfield, NRCS, Agricultural and Stabilizations & Conservation Service, University of Missouri-Extensions, Greene County Soil & Water Conservation District, Missouri Department of Conservation, Watershed Committee of the Ozarks and local landowners based throughout the watershed. As a result, the Watershed Committee of the Ozarks was able to contract with local cooperators for a cost-share effort to implement best management practices.

There were five demonstration and monitoring sites. 1) Gary Lewis Farm, 2) Eddie Smith Bar S Ranch, 3) City Utilities of Springfield Demonstration Farm, 4) Hugh Brewer Low-Pressure Pipe Site, and 5) Crystal Cave Spring.

1) Gary Lewis Farm Demo

Solar powered pump system and shallow alluvial well, fresh water stock tanks at the elevated pasture level, riparian fencing 100' from spring and a dairy waste collection and management system were added to this 65 dairy cow operation. Solids and liquids were separated in the management system, and solids were removed to spread on pasture for fertilization. It was noted that frequency of solids removal is necessary for optimum liquid separation to occur. Due to sediment accumulation in the pump filters and geology constraints, pipes to the solar powered pump system were later diverted to an existing well and the solar panels and pump were relocated to a different project.

Before Prior to this demonstration, dairy cows had direct access to the spring.
Devegetation was evident in the spring area and animal waste was deposited

directly into the spring where dairy cattle were contaminating their own drinking source and nutrients were ultimately making their way to the Little Sac River. The cows tended to stay in the cooler area and would not graze as is desired for optimum weight gain. Many calves were observed in poor condition with fatalities being noted. This operation was suffering economically.

After Economic viability of the dairy operation was rediscovered and nutrient and sediment loading to the R-16 tributary and ultimately the Little Sac River was reduced. No calf fatalities have been observed at this operation since the implementation of best management practices. Cattle have grazed more, animal waste has been more evenly distributed across the pasture and the cows' water supply is cleaner. The added best management practices are now part of daily operations.

2) Eddie Smith Bar S Ranch Demonstration

This site is located in the upper end of the R-16 tributary, west of the Gary Lewis farm. This is a cow/calf operation with a few horses. The herd would water in the drainage area where a small spring exists. Denuded slopes and erosion were prevalent. Cost-share assistance was made available to this operation for watering site relocation and riparian revegetation. This spring was retrofitted to pump water to a higher location, using electricity from residential power lines. The central water system was strategically located on this elevated area to allow access from different pastures. The riparian corridor was also fenced to allow revegetated growth to serve as a buffer.

Maintenance and management for this site has been minimal as compared to the Gary Lewis Farm Demo. These practices demonstrate cost-effective, low-maintenance ways to protect water quality while potentially enhancing the economic value of an agricultural operation.

3) City Utilities of Springfield Farm Demo

The City Utilities of Springfield Demonstration Farm is located at the confluence of the R-18 tributary and the Little Sac River. Best management practices implemented at this site include riparian corridor establishment, solar water system, solar fencing system and pasture enhancement with management intensive grazing.

Before Riparian areas along the streambanks of the R-18 and the Little Sac River exhibited eroded and incised banks. Algal mat potential was evident. Land was leased to local residents for hay production.

After Dramatic improvement is evident five years after re-establishment of the riparian corridor. Activities included fencing, sycamore planting and willow-staking in bank areas, multiple species tree planting in upper riparian area and coconut-fiber biolog implanting in a particularly eroded tributary bank. Diverse species of birds and fish that have never been observed at this site are now present. Aesthetics and habitat have improved considerably.

Solar panels power a water pump 50 yards away, and water is supplied to four stock tanks. Lessons learned from the Gary Lewis farm demo resulted in adequate an adequate chert and gravel alluvium, thereby preventing sedimentation problems in the filters. The only problem encountered was pump damage due to frozen pipelines. Burying the water lines deeper or shutting off the pump in severely cold weather would have prevented this breakdown. Another solar panel was installed for charging the electric fence. On one occasion, bird droppings contributed to reduced generation capacity. Panels are inspected more frequently to avoid this problem.

A management intensive grazing system was developed. Demonstration was provided for different methods of incorporating warm and cool season grasses into divided paddocks (pasture cells). Outstanding growth is evident and these pastures are now being grazed by a twenty-head herd of beef cattle supervised by the Southwest Missouri State University Agronomy Department. A small herd of horses is being grazed in other paddocks as well.

Analysis of the R-16 Tributary

The R-16 tributary has historically exhibited elevated levels of phosphorus. The Gary Lewis Farm and the Eddie Smith Bar S Ranch are located at the headwaters of the R-16 tributary and have been implicated as potential sources of phosphorous loading. Over sixteen years of monitoring from 1983 to 1998, trends in phosphorous levels have generally decreased. Though decreasing trends may be interpreted in part to the practices implemented in this program, it should be noted many external factors such as temperature, sol radiation, rainfall intensity and frequent, and her size could impact trends as well. A qualified analysis of trends is available upon request.

Education and Demonstration Awareness

Numerous field trips have been conducted at these demonstration sites by many organizations and agencies and will continue in the future. The audience has included the agricultural community, teachers, college students and resource managers. Signs are posted to inform local residents of the implemented cooperative efforts.

4 & 5) On-site Wastewater Demonstration at the Hugh Brewer Residence and Ed Mills Residence

Cost-share assistance was provided to the landowners for the construction of their systems only for costs above the price of a “standard” conventional system. The Watershed Committee of the Ozarks monitored performance of the systems.

A low-pressure pipe septic system was installed at the Hugh Brewer residential site. This was chosen as a reasonable alternative to the conventional septic tank systems unsuitable in Greene County due to geographical constraints. This system incorporates an intermittent dosing cycle that enhances treatment of the effluent by allowing the soil to rest between cycles. An alarm is

in place to alert the homeowner if the pump fails. If the homeowner understands the system and provides adequate maintenance, the pump should not fail.

A shallow-trench conventional system was installed at the Ed Mills residence. This consisted of a conventional system with shallow lateral lines buried at a minimum of 18 inches due to a restrictive layer of clay. No problems were observed with the maintenance of this system and surfacing wastewater has not been detected even though the lateral lines are quite shallow.

Analysis of On-Site Wastewater System Demos

The Hugh Brewer low-pressure pipe system adequately treated its waste. Some months were too dry to collect samples. Monitoring and analyses will continue. Analysis at the Ed Mills site could not be completed due in part to lack of soil moisture conditions and a prolonged delay in the construction of the residence. Monitoring and analyses will resume in the future.

Other Project Elements

The Watershed Committee of the Ozarks also participated in a spring sampling plan (affiliated with other studies) in the Fellow-McDaniel Lakes watershed. Twelve springs were sampled for a variety of analytical parameters. The purpose of this program was to form a database on the shallow groundwater system and analyze land use impacts upon it. The results of this study suggest some springs may be under the influence of wastewater contamination.

In addition to the numerous field trips to the demonstration sites described above, the Watershed Committee of the Ozarks completed home sewage surveys, developed brochures, published articles and sponsored and participated in numerous public events highlighting the elements of this project.

Detailed information and formal studies affiliated with this project can be obtained by contacting the Watershed Committee of the Ozarks in Springfield, Missouri, at (417) 866-1127.

Osage Fork of the Gasconade River Watershed (completed in 2001)

The Osage Fork Livestock Waste Management Project supported technical assistance for the Laclede County Soil and Water Conservation District (SWCD) to provide a Resource Management Specialist and a Pumping Technician in the watershed. The specialist and technician were employed by the Laclede County SWCD and stationed in the Lebanon, Missouri office.

Common uses for the streams within the Osage Fork watershed include year-round recreational fishing, boating, swimming, and livestock and wildlife watering. The Gasconade River and nearby aquifers are used as a public drinking water supply by approximately 70,000 residents. Approximately 48,000 of those residents drink groundwater derived from bedrock aquifers, many of which are vulnerable to contamination due to their karst topography nature.

The 325,000 acre watershed contains approximately 250 dairies (totaling an estimated 36,000 dairy cows) and 36,000 head of beef cattle with 7% cropland, 33% forest, 50% pastureland, 7% urban/farmstead roads, 1% water and 2% public ownership.

Many acres of the pastureland are currently overgrazed, producing sediment runoff and resulting in deterioration of water quality and soil conditions. Excessive sediment runoff decreases the moisture available to plants for development, increases the sediment load, increases the contamination of surface water sources and decreases the holding capacity of surface water sources. This condition, when coupled with the karst nature of the Ozark region, makes the area highly vulnerable to surface and groundwater contamination. The Osage Fork watershed is home to the Bluestripe and Least Darters, among several other species, which are listed as either Rare, Endangered or on a Watch List.

Sponsor objectives were: (1) to provide technical assistance (through outreach and demonstration) to area producers in planning for and implementing best management practices to reduce groundwater and surface water contamination; 2) to routinely monitor nutrients (N,P,K) and other nutrient levels in soils at designated waste application sites; 3) to routinely monitor nitrogen, dissolved oxygen and macroinvertebrates in area streams and springs at or near selected demonstrations sites; 4) to develop guidance materials recommending acceptable effluent application rates for nitrogen and phosphorus and related acceptable best management practices; 5) to survey landowners before and after demonstrations to determine effectiveness of project; 6) to monitor land use and how it will affect long-term management practices; and 7) to reduce and control nutrient concentrations leaving the fields in surface runoff or by leaching to the groundwater resource.

Project Period: 1996--2001

Sponsor: Laclede County SWCD

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|----------|------------------|-----------|
| Funding: | EPA/DNR | \$464,760 |
| | Nonfederal match | \$380,259 |

Contact: Laclede County SWCD
Joyce Johnson
Route 6, Box 373C
PO Box 1015
Lebanon, MO 65536
(417) 532-6305

Miami Creek/Drexel Reservoir Watershed (completed in 2001)

The project encompassed approximately 80,000 acres of land within Bates County, Missouri. The watershed is made up of three hydrological units within the Upper Osage/ Marais des Cygnes River Basin. Included within this project area is the Butler Municipal Reservoir, the city's intake located on Miami Creek, and the Drexel water supply reservoir. Together, these supply drinking water to the cities of Butler, Drexel, Amsterdam and five public rural drinking water districts. These reservoirs are also used for recreational activities such as fishing. With the encroachment from the Kansas City Metropolitan area increasing, so is the demand for safe usable water in the area.

Results from water monitoring completed by the cities and the Department of Natural Resources have detected high levels of the herbicide atrazine in their water supplies. Atrazine was not the only concern in the project area; nitrogen, phosphorus, bacteria, and sediment were other major water quality concerns. Possible sources of contaminants in the watershed included several livestock facilities located in or adjacent to the Miami Creek flood plain and cropland primarily used in conjunction with a corn-soybean-small grain cropping rotation. This rotation typically involved application of atrazine in one out of three years.

The overall goal of the Miami Creek/Drexel Reservoir Protection and Restoration Demonstration Project was to improve and protect the quality of water throughout the watershed. The Miami Creek/ Drexel Reservoir provides water to approximately 8,500 residents, with this figure growing every day. Protecting the water quality in these two watersheds was accomplished by achieving the following objectives: inform, educate and demonstrate controlling chemical runoff, animal waste runoff and sheet and rill erosion by implementing best management practices. A project goal to reach greater than 95 percent of the land users to be educated about the proper techniques in protecting the water quality in the Miami Creek/Drexel Reservoir watershed.

Project Period: 1996 -- 2001

Sponsor: Osage Valley RC&D

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|----------|------------------|-----------|
| Funding: | EPA/DNR | \$507,712 |
| | Nonfederal match | \$415,401 |

Contact: Osage Valley RC&D
Stephen Wilson
100 Wesmor, Suite 2
Clinton, Missouri 64735
(816) 885-5052

James River/Table Rock Lake Watershed Partnership (completed in 2000)

Table Rock Lake was created in Southwest Missouri in the late 1950s. It is a popular recreational lake, drawing millions of visitors a year. The waters in this region have been historically known as high quality resources. Fishing for bass, crappie, and other game fish, boating swimming, scuba diving, and other fresh water activities have been vital components to the area's economy. There have also been plans proposed recently to use Table Rock Lake as a drinking water source for the ever growing community of Branson. The growth of the area is phenomenal and is continuing. Branson, although not in the James River Basin, relies on the quality of the area's lakes for its economic viability. Branson housed over 6,000,000 visitors in 1994. It was expected that this number would increase to over 10,000,000 by the year 2000. The James River is a major tributary to Table Rock Lake and has portions of the city of Springfield within its watershed.

Water quality monitoring results from recent years show trends of higher total phosphorus, total nitrogen, and chlorophyll levels and lower Secchi disk readings in Table Rock Lake near the

dam. One of the main purposes of the study was to discover the sources of nutrient enrichment in the lake. Increased loading of nutrients and sediments from recent development and from animal agriculture in the watershed have promoted algal growth and decreased water clarity. Nutrient rich wastewater additions come to Table Rock Lake from Springfield to the James River Arm of the lake and from numerous small treatment facilities as well as from nonpoint sources in the watershed.

A watershed partnership was designed to use the Table Rock Lake study and the coordination of all of its members to produce a whole-basin watershed management plan. It was important and appropriate to study the lake and watershed at this time to determine the causes of the decline. This gave us solid facts to use in a complete watershed strategy.

Project objectives included forming a James River Watershed Partnership composed of people who live work, and play in the James River Basin and was designed to protect that watershed. The partnership coordinated with the University of Missouri's Table Rock Lake Water Quality Study to determine more about the apparent decrease in water quality. The final output from this watershed partnership was the development of a whole watershed plan.

Project Period: 1996 -- 2000

Sponsor: Southwest Missouri RC&D

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| Funding: | EPA/DNR | \$147,914 |
| | Nonfederal support | \$ 57,252 |

Contact: Southwest Missouri RC&D
Rita Mueller/Pamela Anderson
Plaza Southwest Center
W. Hwy. 60
Republic, Missouri 65738

Public Water Supply Watershed Management Education (completed in 1999)

Six public drinking water reservoirs in western Missouri were identified in 1994 as having atrazine levels exceeding the maximum contaminant level (MCL) of 3 ppb established by the Environmental Protection Agency (EPA). These lakes are located in Adrian, Dearborn, Drexel, Hamilton, Higginsville and Jamesport. The watersheds surrounding these lakes are primarily used for agricultural production. It was our intention to form a community based watershed alliance for each of the six reservoirs to ensure long-term management and compliance.

A project coordinator worked with the six identified communities for a three and one-half year period. The project coordinator provided overall leadership and assisted local Extension faculty with developing management strategies for area landowners and agricultural producers, helped establish watershed alliances within the communities, and developed a watershed based approach to insure water quality.

Selected Extension specialists working and living in the communities developed working groups that implemented an education program and developed a community watershed alliance. The education program will teach local citizens and officials how to develop strategies to protect their public water supply and enhance community involvement.

Project products will included: 1) examples of watershed management plans that can be used in other areas of the state; 2) local citizens groups established to monitor and ensure water quality standards of public drinking water supplies; and 3) best management practices implemented in the watershed for the reduction of atrazine plus other agricultural runoff.

Project Period: 1995 -- 1999

Sponsor: University of Missouri - Columbia, Extension

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| Funding: | EPA/DNR | \$306,757 |
| | Nonfederal match | \$250,930 |

Contact: University of Missouri - Columbia
University Extension
205 Agricultural Engineering
Columbia, Missouri 65211
(573) 882-0085

Niangua Basin Planned Grazing Demonstration (completed in 1999)

The Southwest Missouri Resource Conservation and Development Council (SWMO RC&D), Inc. received NPS funds to provide annual incentive payments to producers for implementing and demonstrating managed grazing systems that protect ground cover, reduce quantity and improve quality of runoff water, and provide more efficient forage production. The funds also supported soil testing and informational activities.

The project area included about 236,000 acres and contained intensive dairy and beef operations with emphasis on forage production, either for hay or pasture. The watershed is a karst area that includes sinkholes, losing streams, caves, and permeable soils. These areas are extremely vulnerable to contamination by allowing surface runoff to enter deep ground water or the Niangua River. The watershed area is also a major recreation area providing canoeing, fishing, and other outdoor activities. Bennett Springs State Park (a major trout fishing area) is also located in the project area. The final destination of the Niangua River is the Lake of the Ozarks.

Objectives of this project were: 1) to demonstrate best management practices for pasture management and utilization of animal waste to prevent nonpoint source pollution 2) to inform local and regional landowners of the economic and ecological benefits of proper pasture management and 3) to demonstrate riparian corridor protection as a part of the total farm system.

Grazing practices demonstrated:

Rest-rotation grazing: Multiple pastures (paddocks) leaving one or more idle each year.

- Deferred rotation: Discontinued grazing on different parts, allows each grazed part (pasture/paddock) to rest a growing season.
- Twice-over rotation: Rotates animals faster allowing for a long period of rest between rotations.
- Start-duration: Rotation using multiple pastures/ paddocks. Involves large herd, many small parts, and high stocking density.

Six livestock/dairy operations were selected to participate as model sites to demonstrate the effectiveness of grazing best management practices. Systems installed were customized to each producer. Incentive payments were provided for participation. Implementation of a total resource management system was required of each participating producer.

Demonstration farms participated in two to three annual tours jointly sponsored by University Extension, the Natural Resources Conservation Service and the SWMORC&D. A series of workshops were held each year to provide training to landowners and agency personnel working in the region. Participants gained knowledge in (1) plant growth, (2) plant management, (3) soil fertility, (4) species selection, (5) livestock needs, (6) water development, and other aspects of a controlled grazing system necessary to derive economic and environmental benefits of participation.

Site level monitoring was conducted and included annual soil sample collections of the individual paddocks within the grazing system to be tested for nutrients (nitrogen, phosphorus and potassium). Monitoring provided necessary parameters for on-farm evaluation of intensive grazing systems.

MDC will developed four stream wildlife riparian management areas. The Missouri Department of Conservation provided cost-share to install wildlife areas that included tree and shrub plantings, livestock exclusion, natural vegetation, tree revetments, riffle structures, rip-rap and anchored root wads.

- Project period: March 1, 1994 to December 31, 1999
- Sponsor: Southwest Missouri Resource Conservation and Development
- Funding: EPA/DNR \$101,000
Nonfederal match \$ 82,636
- Contact: Southwest Missouri Resource Conservation and Development
Plaza Southwest Center, Suite 301C
Republic, MO 65738
Telephone: (417) 732-6485

Fulbright Spring Urban Recharge Area Watershed (completed in 2000)

Fulbright Spring has been in use as a public drinking water source by the city of Springfield since the 1880s and continues to supply about twenty percent of the source water on an annual

basis. The approximate recharge area, roughly defined in the 1970s, was further refined through a 1990 EPA-funded wellhead protection monitoring system study. About one-third of the 23,000 acre inferred recharge area is within the city of Springfield and the remainder is in the unincorporated area of Greene County. A substantial portion of the spring's flow is derived from losses of surface streamflow in the upper South Dry Sac basin. Sinkholes in the basin have also been shown to contribute flow. City Utilities routinely monitors the spring for a host of Safe Drinking Water Act contaminants. Data indicate that the water quality of the spring remains relatively high in spite of occasional spikes of some parameters such as turbidity and fecal coliform, during storm events. This is not surprising given the open nature of this karst hydrologic system, with its high degree of surface - groundwater interaction.

Fulbright Spring is probably the most easily compromised of any of the city's raw water sources. The largest concern from a water treatment standpoint is organic chemical contamination such as biocides, hydrocarbons and solvents. The use of such materials in the spring recharge area is expected to increase with expanding urbanization. Without a protection program in place as urbanization proceeds, the spring would likely degrade to the point of requiring sophisticated and expensive water treatment processes or abandonment as a source. This project was designed to prevent that possibility.

The three major components of the project were: watershed and spring monitoring, best management practice implementation and monitoring, public education and public involvement.

Project Period: 1996 -- 2000

Sponsor: Watershed Committee of the Ozarks

| | | |
|----------|------------------|-----------|
| Funding: | EPA/DNR | \$100,000 |
| | Nonfederal match | \$ 90,000 |

Contact: Watershed Committee of the Ozarks
Adam Coulter
300 West Brower
Springfield, Missouri 65802-3817
(417) 866-1918

Bryant Creek Tributaries Water Quality Demonstration Project (completed in 2002)

The boundary of this watershed project was Bryant Creek and its' tributaries within Douglas and Ozark counties. Bryant Creek empties into Norfolk Lake, a public water supply for the city of Mountain Home, Arkansas. The watershed is approximately 250,000 acres with more than 70 dairies, approximately 5,000 head of dairy cattle and an estimated 14,000 head of beef cattle. The water quality of Bryant Creek and its tributaries is potentially degraded by the presence of these dairy and beef cattle operations. Animal wastes, coming off-site from concentrated animal feeding areas, dairy milking parlors, loafing areas, improper rates and timing of manure applications to overgrazed fields and from direct deposition of animal wastes into creeks, have negative impacts on fish and other wildlife dependent on the streams for habitats and also for recreational users of the water resources.

At the time of the project, the primary impacts the animal wastes have on Bryant Creek watershed were nutrient loading through runoff. The nutrients of concern were nitrogen and phosphorous. High bacteria levels (fecal coliform and fecal streptococcus) and other pathogens were also a concern to recreational users of Bryant Creek, particularly swimmers, fisherman and canoeists. Douglas County and Ozark County rank 7th and 14th respectively in the state in milk cows and 21st and 33rd in the state respectively in beef cattle. Livestock wastes produced from these enterprises are considered to be a major water quality concern along with the excessive sedimentation caused by erosion in over-grazed pasture land and the lack of established riparian areas along streams of the watershed. Within the project area, there were only two permitted dairies, one in Douglas and one in Ozark County. The upper end of the watershed, located in north central Douglas County, had the greatest concentration of animal feeding operations with more than forty dairies.

The NRCS hired a full-time nutrient management specialist/conservationist whose primary responsibility was to coordinate the activities of the project area. Technical support was also provided by NRCS field office and area office staff in the design and installation of animal waste management systems. These NRCS staffs also provided assistance in developing resource and nutrient management plans for landowners in the watershed area. Staff developed 40 nutrient management plans written to address the vegetative filter strips along concentrated animal feeding/traffic areas, proper nutrient management through proper timing and spreading of manure applications, and intensive/rotational grazing systems establishment.

There were three animal waste management demonstration farms installed, four grazing management demonstration farms installed, and three riparian corridor management protection farms installed with alternative watering systems demonstrated. Once these demonstration farms were established, there was one tour or field day the first year demonstrating an intensive/rotational grazing system; two the second and third years demonstrating animal waste management systems, intensive/rotational grazing systems, and riparian corridor establishment and protection with alternative watering systems; and four the fourth and fifth years demonstrating the same systems as shown in the second and third years. To complement these animal waste demonstration systems and to assist other operations within the watershed in the proper utilization of animal wastes, animal waste spreading equipment was purchased the first year of the project.

There was also volunteer monitoring of Bryant Creek to determine trends in water quality within the stream. Stream teams trained in water quality monitoring conducted this monitoring.

Information, education and technology transfer were accomplished through the use of informational materials, demonstration field days, news articles, SWCD newsletters, radio public information programs and the Neighbor-to Neighbor program sponsored by the Douglas and Ozark County SWCDs. Soil and effluent testing, along with volunteer stream team monitoring, were also methods by which this will be accomplished. The target audience was primarily beef and dairy producers within Bryant Creek watershed.

Successes were documented by the implementation of BMPs that were written into resource and nutrient management plans for landowners in the watersheds. The BMP implementation used to measure the success of this project were the installations of successful animal waste management systems, acres of pasture land put under intensive/rotational grazing management systems, lengths of riparian corridors established and streambanks stabilized and protected, numbers of alternative watering systems installed, tons of manure properly utilized, and general changes of attitudes by landowners in the watershed as determined by surveys.

Project Period: November 15, 1997--November 14, 2002

Sponsors: Douglas and Ozark Counties' Soil and Water Conservation Districts

| | | |
|----------|------------------|-----------|
| Funding: | EPA/DNR | \$474,086 |
| | Nonfederal match | \$328,390 |

Contact: Mr. Gregory B. Watkins
Douglas County SWCD
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Ava, MO 65608
(417) 683-4816

Turkey Creek Watershed Protection Project (completed in 2002)

The Turkey Creek watershed project area encompasses 61,000 total acres with the majority of the project area, approximately 57,750 acres, being in Carroll County, while approximately 3,250 acres is located in Ray County. At the time of the project, there was no urban land located within the drainage area. Land uses in the project area includes an estimated 60 percent in row crop production; 30 percent in grassland including Conservation Reserve Program (CRP) land; and the remaining 10 percent is devoted to other uses such as roads, farmsteads, and livestock facilities. There are approximately 310 landowners located in the project area, which is all agricultural. Row crop farming is the primary land use for the area, but there are several fairly large livestock confinement units for hogs, beef cattle, and dairy cows. While none are large enough to require a permit, eleven are registered with the DNR as Class II operations. Most of these operations have a small lagoon and apply waste products by spreading the material over fields near the waste storage structure. Timing of the present applications is not always the best for water quality.

Excessive chemicals, nutrients, and animal wastes were problems identified by the Department of Natural Resources in the watershed. Landowner contacts resulted in the same concerns being identified, and the producers are searching for solutions both to take care of the environment and to stay in compliance with all governmental regulations. The objectives identified by landowners were to improve waste treatment and handling for each livestock operation, to reduce the amounts of pesticides and fertilizers applied to cropland, to further reduce the level of soil erosion and sedimentation, and to treat 75 percent of CRP ground released with no-till farming, rather than conventional tillage. Grant funds were not used as incentive payments to support no-till farming.

Producers in the Turkey Creek watershed were asked to develop Total Resource Management (TRM) plans which include BMPs for livestock waste management, the proper use and application of pesticides and fertilizers, and the installation of erosion control practices to reduce sedimentation. Cost-share incentives were available to those producers who developed and implemented plans to improve water quality. Integrated crop management specialists from the private sector, the Natural Resources Conservation Service (NRCS), and the University Extension Service were available to advise operators on the proper use and application of pesticides, animal waste and fertilizer. An incentive was offered to those producers who use this service to properly apply correct amounts, which should reduce the runoff of improperly applied or over applied chemicals. Funding to install these practices came from the AGNPS SALT Cost-Share Program administered by DNR's Soil and Water Conservation Program and from the Federal Environmental Quality Incentives Program.

There had been no water quality sampling in the past that the District is aware of, but the Stream Team from Norborne High School agreed to sample water at two locations recommended by WPCP staff which include one site on Turkey Creek upstream of the confluence of Wakenda Creek and one site on East Fork Wakenda Creek near the confluence of Wakenda Creek. The Stream Team monitored water temperature, pH, conductivity, nitrate-N, ammonia-N, phosphorus, dissolved oxygen and macroinvertebrates.

The Turkey Creek Watershed Protection Project had the goal of informing and educating 95 percent of the land users within the project area. To accomplish this goal, an ambitious information and education program was scheduled. Eleven workshops targeting producers from all the major land use areas were conducted. Six field days at good demonstration sites were selected and toured during the project, which included a waste management demonstration and a streambank stabilization site.

Fact sheets relating to BMPs and ICM were developed and published in a joint effort of the SWCD, NRCS and University Extension. A landowner survey of land users' knowledge of BMPs was taken at the start of the project and again at the end to measure results of the educational efforts. Success stories from the use of BMPs and ICM were compiled and published to share with operators in the project area. A newsletter was published by the District twice per year during the life of the project and was mailed to all the landowners and operators in the project area. Additionally, news articles relating to workshops, field days, and project information were published in the local papers to publicize the project.

Project Period: October 1, 1997--September 30, 2002

Sponsor: Carroll County SWCD

| | | |
|----------|------------------|-----------|
| Funding: | EPA/DNR | \$257,555 |
| | Nonfederal match | \$171,705 |

Contact: Mr. David Cain
Carroll County SWCD
Route 1, Box 211C

Carrollton, MO 64633
(660) 542-3361

Bonne Femme Watershed Project (completed in 2002)

Residents of the Bonne Femme and Little Bonne Femme watershed in south central Boone County formed a partnership to identify local water quality problems and to develop community-based strategies to reduce nonpoint source water pollution in the watersheds. The 92.4 square mile project area includes Rock Bridge Memorial State Park, Three Creeks State Conservation Area, and four officially designated outstanding state resource waters (i.e., Turkey Creek, Bass Creek, Gans Creek, and Devil's Icebox Branch). The watersheds include diverse aquatic habitats that are characteristic of prairies as well as Ozark forests. Several endangered species are present in the area, including the Gray Bat, Indiana Bat, and Topeka Shiner. There are also extensive areas of karst topography and numerous caves in the watersheds.

At the time of the project, the project watersheds included a mix of cropland, pasture, forest, and residential developments. Economic pressures had been developing in recent years to expand residential, commercial and industrial development in the watersheds, especially along the Highway 63 corridor between Columbia and Ashland. This corridor is the headwaters for all major streams in the watersheds. Rapid and uncontrolled development in the Bonne Femme and Little Bonne Femme watersheds could significantly impact water quality in the outstanding state resources waters, threaten several endangered species in the watersheds, and disrupt sensitive ecological systems in Rock Bridge Memorial State Park and Three Creeks State Conservation Area. In selected areas of the watersheds, agricultural practices and urban development had already degraded stream banks and riparian areas. Current and future urban nonpoint sources of water pollution in the watersheds included microbial contamination from on-site sewage systems; storm water from residential, commercial, and industrial developments; sediments from construction sites; and nutrients and pesticides from residential lawns and development grounds.

The 319 project focused on stream restoration and prevention of urban nonpoint sources of water pollution. The Boone County Soil and Water Conservation District was funded by the Missouri Department of Natural Resources for a SALT AGNPS Project (Special Area Land Treatment - Agricultural Nonpoint Source) that addressed agricultural nonpoint sources in the watersheds. A Watershed Steering Committee was formed under the SALT AGNPS project and expanded to include additional stakeholders from the watersheds. The Steering Committee set priorities, establish objectives, and help coordinate implementation of the project (USGS 1994). Project activities were designed to increase watershed resident awareness and appreciation of water quality and stream issues, coordinate volunteer and agency resources for stream restoration, demonstrate urban best management practices, and provide technical assistance to watershed residents for implementing best management practices. Project activities were supported and guided by professionals affiliated with conservation, agricultural, and health agencies operating in the watersheds. The project included extensive inter-agency coordination between local, state, and non-governmental organizations.

Project Period: August 1, 1998 to July 31, 2002

Sponsor: Show-Me Clean Streams

| | | |
|----------|------------------|-----------|
| Funding: | EPA/DNR | \$255,030 |
| | Nonfederal match | \$245,569 |

Contact Person: James R. Davis, Ph.D.
Show-Me Clean Streams
9642 South Route N
Columbia, MO 65203
(573) 657-6108
(573) 882-3384

Little Niangua River Watershed Restoration

Originally, the Little Niangua River was the largest tributary to the Niangua River, but it now drains directly into the Lake of the Ozarks. Concentration of livestock along streams has destabilized a large portion of the banks of the river, as well as its tributaries, resulting in an increase of sediment and nutrient loading into the river, its lower reaches and the Lake of the Ozarks. Many efforts have been put forth by numerous agencies to address similar problems in the neighboring Niangua watershed. Those efforts to protect water quality have included demonstration projects, water quality monitoring, education activities and cost sharing for animal waste holding systems. These efforts are also needed in the Little Niangua River watershed to improve and protect water quality in the Little Niangua River and the Lake of the Ozarks. This watershed was listed as #61 in the 1998 Missouri Unified Watershed Assessment.

PROJECT DESCRIPTION

The project will support the restoration and protection of streambanks and the establishment of rotational grazing systems with alternative water supplies. Tours and demonstrations will be given to create public awareness of how water quality and the environment are protected by the adoption of best management practices.

PRODUCTS

Alternative watering systems
Fenced paddocks
Educated livestock producers

Sponsor: Dallas County Soil and Water Conservation District

Cooperators: Natural Resources Conservation Services, the Department of Conservation and the University of Missouri Extension Program.

Contact: Joe Cooper
Dallas County Soil & Water Conservation District
RR 3, Box 80, S Hwy. 65
Buffalo, MO 65622
(417) 345-2312

Elk River Water Quality Demonstration Project

The 483,000-acre Elk River Basin located within Missouri consists of Indian Creek, Little Sugar Creek, Big Sugar Creek, Buffalo Creek, Elk River, and their tributaries. The watershed is located in the most southwestern part of Missouri in McDonald, Newton, and Barry counties. The Elk River flows westerly entering Grand Lake of the Cherokees north of Grove, Oklahoma. The entire Elk River Basin drains about 870 square miles in Oklahoma, Arkansas, and Missouri.

Approximately 6,000 people live in the Elk River Basin. The basin is estimated at 68 percent grassland, 25 percent forest land, and 7 percent other--water, roads, farmsteads. There are about 1,500 farms/cooperators in the watershed (about 275 of these are confinement operations). Sources of pollutants within the Elk River Basin may include municipal and septic system wastes, livestock and poultry manure/litter, fertilizers, pesticides, sediment/erosion, and recreational use of the streams (human contact with streams and trash).

The Elk River, along with the Neosho and Spring rivers, flows into the Grand Lake of the Cherokees. According to a Missouri Department of Natural Resources (MDNR) report on the Grand Lake of the Cherokees, fecal strep and certain nutrients including phosphorus and nitrogen have been identified as posing a threat to the overall quality of that lake. Therefore, excessive nutrients are potential problems and concerns to the tributaries, springs and ground water resources within the drainage basin of the Grand Lake of the Cherokees.

This project will compliment the existing Poultry Litter/Nutrient Management Demonstration in the Upper Shoal Creek Watershed. In the Shoal Creek 319 project, poultry litter and soil samples are being taken on ten demonstration farms to develop nutrient budgets that tell how much litter should be applied to the land. Information learned from the Upper Shoal Creek Watershed will be used to the benefit of the cooperators and residents in the Elk River Basin and the rest of the poultry producing counties. The Elk River Water Quality Demonstration will show various practices. Landowners will be able to visit nearby farms within the basin to learn techniques to improve water quality.

The purpose of this project is to help prevent pollution through the use of demonstrations, water and soil quality monitoring, information/education, and technical assistance. The project will demonstrate four poultry litter stacking shelters, two litter hauling seminars, six grower nutrient management sites, two septic system maintenance/clean-outs, three riparian corridor repair and management sites, and three livestock and pasture management systems. The Elk River Water Quality Demonstration project will illustrate various practices that if implemented will contribute to improved water quality in the watershed.

An Elk River Basin brochure will be produced to increase water quality awareness. Stacking shelter guidance materials will be produced and distributed. Soil samples will be taken on farms within the watershed during the project period. A video will be produced explaining nutrient management. Fact sheets, newsletters, news releases, and radio programs will be used to promote the practices demonstrated through the project.

Groups involved in the project include Southwest Missouri RC&D; NRCS; MOARK Productions; Simmons Industries, Inc.; Tyson Foods, Inc.; Missouri Poultry Federation; contract growers; litter haulers; livestock producers; Elk River Advisory Committee; McDonald, Newton, and Barry County Soil and Water Conservation Districts; Missouri Department of Conservation; McDonald, Newton, and Barry County Health Departments; septic system contractors; University Extension; United States Geological Survey; Missouri DNR; and EPA.

Project period: January 1, 2000--December 31, 2004

Sponsors: Southwest Missouri Resource Conservation and Development Council, Inc.

| | | |
|----------|---------------------------|-----------|
| Funding: | EPA/MDNR | \$454,400 |
| | Nonfederal match | 303,600 |
| | Total Project Costs | \$758,000 |

Contact: Southwest Missouri Resource Conservation and Development, Inc.
329 W. Highway 60
Republic, MO 65738
Rita Mueller (417) 732-6485

The Little Sac and Sac River Watershed Restoration Action Strategy Project

The Little Sac River watershed encompasses about 400 square miles of the 1970 square mile Sac River basin in southwest Missouri. There are two drinking water reservoirs and one 27-mile stream segment within this watershed on the state's final 303 (d) list. Nutrients and fecal coliform are pollutants responsible for the listing - nutrients for the two reservoirs and fecal coliform for the Little Sac River. Furthermore, the Sac River watershed is the #3 priority watershed in the recently completed "Unified Watershed Assessment." Concerns relate to nutrient enrichment, biological impairment, drinking water source protection, karst geology and large numbers of livestock in the basin. The entire Little Sac watershed is a public water supply source area containing two reservoirs, Fellows & McDaniel Lakes, plus Fulbright Spring and Stockton Lake, all utilized for municipal water supplies. The large intake on Stockton Lake is designed to serve the high growth areas of Springfield and Greene County for the next fifty years.

A minigrant to the Greene County Soil and Water Conservation District is supporting development of a Watershed Restoration Action Strategy (WRAS) for the Little Sac and Sac River. The WRAS will identify the seven elements specified by the Environmental Protection Agency, Region VII, as follows: (1) public outreach methods; (2) monitoring and evaluation activities based on water quality goals and outcomes; (3) specific water quality problems; (4) identify a watershed coordinator/evaluator; (5) blueprint of actions to be taken and desired water quality goals and outcomes; (6) schedule of implementation; and (7) funding needs.

Project period: November 1, 1999—November 1, 2000

Sponsor: Green County Soil and Water Conservation District

Cooperators: Natural Resources Conservation Service, Watershed Committee of the Ozarks, MO Department of Conservation, MO Department of Natural Resources

Contact: Larry Jones
Green Co. SWCD
688 S. State Hwy. B, Suite 200
Springfield, MO 65712
(417) 831-5246

Fox River Ecosystem Development Project

The 136,822-acre project area is located in northeast Scotland and northwest Clark counties in northeast Missouri. There are approximately 555 landowners in the watershed area. Land use in the watershed is estimated to be 47% cropland, 33% woodland, 15% pastureland and 5% other. The other 5% includes small communities on the fringes of the watershed area and three public use areas owned by the Missouri Department of Conservation. Watershed land usage is as follows: 65,334 acres of cropland (floodplain and upland), 43,363 acres of woodland, 19,925 acres of pastureland and 5,988 acres of public use area.

Critical areas that have a major impact on water quality in the Fox River are as follows. The big head cut in the main Fox River channel has a high sediment delivery rate. Livestock waste enters the Fox River at several areas because livestock have free access to the stream itself. Intensively cropped land immediately adjacent to the main stream and its tributaries are a source of silt and chemicals in the water. A water quality problem identified on the 1998 303(d) list was sediment in the stream. The Fox River Basin Management Plan conducted in October of 1992 by the Missouri Department of Conservation and Soil Conservation Service indicated no streams in the basin were classified for whole body contact due to turbidity, silty substrates and poorly sustained flow. Loss of aquatic habitat has been one result of siltation in the Fox River Channel. The head cut in the main channel of the Fox River is contributing to the siltation problem. Losses of riparian corridor areas have caused an increase in stream bank erosion in some areas of the river. Siltation has resulted in loss of wildlife habitat, reduced or lost recreational value, and lowering of water quality in the Fox River.

The goals of the Fox River Ecosystem Development Project are to protect and improve the quality of water in the entire watershed. This will be accomplished by achieving six major objectives:

Objective # 1:

The first objective is to inform, educate, and demonstrate controlling herbicides, pesticide and fertilizer runoff by 50% through adoption of BMPs in the watershed. Three demonstration projects will be established with land users to demonstrate BMPs. Six underground outlet discharge options will be demonstrated following guidance from NRCS Technical Note 31.

Objective # 2:

The second objective is to inform, educate and demonstrate controlling nutrient and chemical runoff from cropland by using Nutrient Management Plans and Pest Management Plans. Incentive payments will be made to the land users to reduce nutrient and chemical run off from cropland.

Objective # 3:

The third objective is to inform, educate, and demonstrate controlling animal waste runoff and infiltration by adopting BMPs. The project sponsors will provide project funds not to exceed 75% of the cost for the installment of two animal waste facilities and provide incentive payments for the proper application of animal waste. The sponsors will monitor the stream tributaries in the watershed to ensure the objectives of the project are being met and to provide data to inform land users of the benefits of using BMPs.

Objective # 4:

The fourth objective of the project will be completed by utilizing existing programs to develop a wetland area and to demonstrate the role wetlands play in controlling pesticide, herbicide and nutrient runoff. Monitoring will be done down stream to validate expected results on water quality. This information will be used to inform and educate land users and the public on the importance of wetlands on water quality and restore 200 acres of wetlands.

Objective # 5:

The fifth objective of the project is to establish one demonstration riparian corridor area along bare stream banks. Filter strips and livestock exclusion will be included in the demonstration areas. One BMP will demonstrate the proper use of riparian corridor management. These riparian corridor areas will be used to inform and educate land users and the public on the importance of riparian corridor management, filter strips and livestock exclusion and control livestock on 50% of stream corridors. One demonstration practice will be used to help educate land users about stream bank stabilization. These stream bank stabilization demonstrations will be in cooperation with the Missouri Department of Conservation.

Objective # 6:

The sixth objective of the project is improving wildlife habitat. This will be accomplished by landowners adopting the BMPs to reduce chemical and fertilizer runoff, reduce soil erosion, reduce animal waste runoff, developing wetlands and establishing riparian corridors. As land users observe the benefits of BMPs through the demonstration projects, the sponsors feel that the land users will want to continue these beneficial programs by adopting BMPs on a permanent basis.

Those involved in the project include: Clark County SWCD, Scotland County SWCD, the Northeast Missouri RC&D Council, USDA Natural Resources Conservation Service (NRCS), University of Missouri Extension Service, US Fish and Wildlife Service, Missouri Department of Conservation, Missouri Department of Natural Resources, National Turkey Federation, Pheasants Forever, Iowa State University, US Geological Survey, Iowa Department of Natural Resources, and Scotland County Health Department.

Project period: February 15, 2003 – June 30, 2006

| | | |
|-----------|--|-----------|
| Sponsors: | Northeast Missouri RC&D | \$299,509 |
| | EPA/DNR | \$449,263 |
| Contact: | Tommy J. Deberry, RC&D Coordinator | |
| | Northeast Missouri Resource Conservation & Development Council, Inc. | |
| | Route 1, Box 73G | |
| | Memphis, MO 63555 | |
| | Phone: 660-465-8551 Ext. 4 | |

Team Up! Irrigation Project

The Team Up! Project will be carried out in the major irrigation areas of Missouri. The eighteen counties in the program account for over 90% of the irrigated acreage in Missouri. The project is a joint endeavor that seeks to reduce nitrate and other contaminant-degradation of Missouri ground water occurring from inappropriate practices of irrigators in the state.

The reasons water quality in Missouri is vulnerable are several fold. One is the nature of the crop-soil relationship in the state. Much of the new irrigation is on corn, watermelons, and potatoes, crops that traditionally have used high amounts of nitrogen. One of the first soil types put to irrigation is sandy soil, the soil that leaches the easiest. Thus high-use nitrogen crops and susceptible soils are often teamed together, creating a potentially dangerous situation for the ground water. It is important that water and nitrogen be balanced to ensure best yields and limited deep percolation of nitrogen. It is for this reason that best management practices be holistic and include management for water and management for nitrogen.

PROJECT DESCRIPTION

The eighteen largest irrigated counties in the state will be broken down into five units based on their proximity to each other. Each county has a county agent, called a Regional Specialist. The Regional Specialist will locate a cooperator who wishes to follow the water/fertility recommendations of the University. Full-scale uniformity tests will be conducted on pivot irrigation systems enrolled in the demonstration project each year. The cooperators will be paid a \$3/acre incentive to schedule irrigation and record gypsum block readings. The one exception to this is the northeast unit, in which a summer technician will be hired to do the monitoring. Gypsum blocks and an accurate rain gage will be installed at each site. Local weather data from UMC weather stations will be imported into an irrigation scheduling program to calculate daily water use. The sites will be visited once a week and blocks read. The farmer or the technician will then plot the block soil moisture readings against the computer-generated soil moisture estimates to evaluate the irrigation scheduling estimates. Based on the computer recommendations and block readings the grower will decide when to irrigate.

OBJECTIVES

Objectives 1.) Irrigation scheduling: Increase the use of scientific irrigation scheduling by 100%. Approximately 15% of growers now use scheduling.

Objective 2.) Improving irrigation system uniformity: Test 150 pivots and have 50 pivots be re-nozzled to apply water more uniformly and make growers aware of the importance of uniformity.

Objective 3.) Decreasing pre-plant nitrogen amounts and any unnecessary N applications (decrease the pre-plant amounts of N on corn by 25%).

METHODS EMPLOYED

The goals are to decrease the amount of nitrogen and other agricultural chemicals leached into Missouri's ground water on irrigated soils by (a) increasing the use of scientific irrigation scheduling, (b) increasing irrigation system uniformity's, and (c) decreasing the amounts of pre-plant nitrogen applied and monitor to see if later applications are needed.

PRODUCTS

1) 40 Demonstrations, to include at each site:

- gypsum blocks down to 3 depths two different locations
- rain gage
- demonstration project sign
- two marker, reference blocks 30' x 30' where ample N is applied
- over flight of field to shoot foliage color
- digitization of picture to make N recommendations given to the grower
- uniformity of pivot tested and recommendations made

2) 3000 generated radio PSAs sent to local radio stations re: current water use rates

3) 1200 generated newspaper tables and/or graphs sent to local newspapers re: weekly water use rates

4) web-based educational tools, to include:

a) *a web-based fertigation rate calculator*

- + calculates amount of N required and sizes chemigation pump

b) *a web-based fertigation recommendation generator*

- + it tells when to over-fly field, when to stop applying N, probability of rainfall based on historic patterns—not a good time to apply N

c) *a web-based chemigation equipment page*

5) 20 field days/night meetings (based on RS's preferences)

And four Annual Irrigation Conferences that are multi-linked to up to 6 locations (Portageville, Mexico, Nevada, Columbia, Jefferson City and St. Joseph).

Cooperators: University Outreach & Extension, the Department of Natural Resources, Natural Resources Conservation Service (NRCS), Soil & Water Conservation Districts (SWCDs)

Sponsor: University of Missouri Columbia

Contact: Joseph Henggeler
State Irrigation Specialist
University of Missouri
P. O. Box 160
Portageville, MO 63873
Phone: (573) 379-5431
henggeler@missouri.edu

Stewardship Implementation Project (SIP)

In 1998, the Watershed Research, Assessment, and Stewardship Program (WRASP) was created. The goal of WRASP is to develop a better understanding of the causes of agricultural runoff and to help local people improve water quality in watersheds across the state. Building upon the successful implementation of WRASP and its programs, the Stewardship Implementation Project (SIP) will begin an implementation phase that will take the knowledge gained and apply it on the ground by working with farmers in their fields. The goal of SIP will be to accelerate implementation of agricultural production practices that increase the level of protection for the environment while maximizing profitability for producers through on-farm crop, conservation, and information management assistance. A specific goal of SIP is that the targeted watersheds be delisted from the Section 303(d) listing.

This project will accomplish its goals through direct one-on-one on-farm technical assistance and through field scale demonstrations of selected production practices, new technologies and management strategies. The program will utilize an Integrated Crop Management (ICM) systems approach to crop production. It will be unique to the specific watershed, field and grower. The program will demonstrate how ICM can improve profitability for the producers while decreasing the potential for pesticide, nutrient and sediment contamination of water runoff. The ICM production system, as utilized in this project, will encompass the best production techniques in terms of pesticide and nutrient management for both agricultural productivity and environmental stewardship. It is recognized that several individual activities and management techniques will comprise the components of the ICM system.

Participating farmers for their farmer neighbors will offer field tours of the side-by-side demonstration sites. These sites will provide in-field comparisons of conventional production systems and a comprehensive ICM system. Key producers in selected watersheds can share the details of their production practices and personal experiences with those in attendance, what was done, why, and how it worked on their farms. Information transfer, grower education and adoption begin here. Each demonstration site will be signed identifying the location as utilizing products, technologies, production practices and ICM systems for their economic and environmental benefits.

Water samples will be collected in streams and lakes in the project watersheds. The samples will be analyzed for various contaminants including pesticides, nutrients, and sediment. The sampling plan will not be as rigorous as the original WRASP project whereas the purpose of this sampling will be to document progress made in implementation.

The partners of WRASP are expected to continue to support SIP. These organizations include: the Missouri Corn Growers Association, Missouri Department of Natural Resources, Missouri Department of Agriculture, U.S. Environmental Protection Agency, Syngenta, Inc., U.S. Department of Agriculture-Natural Resources Conservation Service, U.S. Department of Agriculture- Agriculture Research Services, and the University of Missouri-Columbia. Besides Syngenta, it is expected that more corporate partners will participate in SIP.

As a component of this project, a survey instrument will be developed. This survey will measure the extent by which practices being promoted by the project are being adopted by the producers in the watersheds. The survey will estimate adoption of the pesticide, nutrient, and sediment management practices. The survey will be conducted throughout the project in order to access progress on an on-going basis. The Soil and Water Conservation Districts in the targeted watersheds will be asked how many acres they have enrolled in integrated pest management and nutrient management planning cost-share programs to measure adoption and implementation trends.

Tasks:

Identify to the extent possible the areas in watershed with the greatest potential impact on water quality as targets.

Establish and maintain working relationships with key producers and in areas targeted for greatest potential impact.

Establish and maintain field scale demonstration sites.

Data information management and decision support system developed.

Data information management and decision support system utilized by demonstration site cooperators.

Economic analysis completed on demonstration sites.

Field days conducted on demonstration sites.

Conduct information/education activities for the watershed.

Develop and implement the survey instrument for all landowners within the watersheds.

Develop, review, revise and implement water quality monitoring plan for assessing effects of BMP implementation on water quality.

Collect and analyze lake-level water samples for pesticide, nutrient, and sediment contamination

Collect and analyze stream-level water samples for pesticide, nutrient, and sediment contamination.

Priority Watersheds

Seven reservoirs and watersheds will be evaluated in the comprehensive study. These include the City of Vandalia reservoir, the Monroe City Route J Lake, the three-reservoir system serving the City of Cameron including Grindstone Lake, Smithville Lake and Salt River Basin of Mark Twain Lake. These lakes are listed by the Missouri Department of Natural Resources on the EPA Clean Water Act Section 303(d) list for the pollutant, Atrazine. The primary cause of this listing has been identified as agricultural non-point source pollution.

Project period: May 1, 2002 – April 30, 2007

Sponsors: Environmental Resources Coalition \$135,000

EPA/DNR

\$200,000

Contact: Steve Taylor, CEO
Environmental Resources Coalition
3118 Emerald Lane
Jefferson City, MO 65109-6860
Phone: 573-893-4181

McCroskie Creek Watershed Project

There is 29,863 acres of upland in the watershed. Approximately 12,115 acres is cropland, and over half of the cropped acres are eroding at a rate of over 2 T (soil loss tolerance factor) per year. A very limited number of producers within the watershed are using Nutrient and Pest Management practices. Combining the excessive amounts of pesticides (primarily herbicides) and nutrients (fertilizer) being applied along with the erosion occurring at a 2 T rate creates a water quality problem when runoff enter the watershed streams which then outlets into the Missouri River. Producers over the years have removed or damaged approximately 60% of the riparian buffers. Fields are being tilled right to the bank of the streams. This creates bank instability, which leads to additional erosion as well as reduces the amount of habitat available for wildlife. In recent years, approximately 2,986 acres of the Conservation Reserve Program (CRP) ground and pasture has either been converted or returned to row crops. Livestock numbers (cattle) have increased approximately 15%. Cattle on most farms have access to streams on a daily basis. This creates a soil erosion problem as well as a water quality problem, which needs to be addressed.

PROJECT DESCRIPTION

The Carroll County Soil and Water Conservation District and the designated partners will provide technical assistance to complete the conservation practices listed under methods employed. With the use of workshops, tours, newsletters and demonstrations, the district will provide area landowners and producers with the education, information and technical assistance needed to achieve the goals set forth in this project.

OBJECTIVES

The objectives of the project are to improve water quality in the watershed and to treat unprotected croplands with soil saving conservation practices. The district will introduce best management practices like No-Till, Pest and Nutrient Management, Filter Strips and Planned Grazing Systems to area producers. Another objective is to introduce practices such as Marginal Pasture, CP9's, Contour Buffer Strips and Contour Stripcropping. Plans include implementing Waste Management Systems and Streambank Stabilization. Vertical outlets on Tile Terrace Systems will outlet into buffer strips before the drainage flows into the area water sources. By introducing and implementing these practices, producers will be holding sediment, nutrients and pesticides in place and reduce excessive amounts of polluted runoff from leaving treated acres.

METHODS EMPLOYED

The goals for this project are to educate the landowners and area producers on implementing best management practices and treat land eroding above T with the following conservation practices:

- 1) 280 acres of Terraces Systems with vertical outlets,

- 2) 525 acres of Cropland Protective Cover,
- 3) 14 acres of Sod Waterways,
- 4) 560 acres Planned Grazing Systems,
- 5) 25 Groundwater Flow Model Demo's
- 6) 28 Well Closings,
- 7) 200 acres of Permanent Vegetative Cover,
- 8) 150 acres of Filter Strips,
- 9) 420 acres of Marginal Pasture,
- 10) 280 acres of Contour Buffer Strips,
- 11) 280 acres of Contour Stripcropping,
- 12) 70 acres of Riparian Forest Buffers,
- 13) convert producers from using Conventional Tillage to No-Till on over 2,000 acres of the cropland,
- 14) introduce and implement both Pest and Nutrient Management on 2,000 acres of cropland, reduce the amount of herbicides and fertilizers that are applied by some 25%, and implement crop scouting on these same acres,
- 15) install four CP9 practices (shallow water area for wildlife),
- 16) build two Waste Management Systems,
- 17) develop demos on the application of Nitrogen and the stabilization of Nitrogen in crop fields,
- 18) and with the help of the Carroll County Commission (Bridge Department) re-establish Streambank Stabilization in 3 locations of approximately 350 total feet.

The funding for these conservation practices will be provided for by several different sources: 319 nonpoint source, AgNPS SALT McCroskie Creek, continuous CRP, Quails Unlimited, local state cost-share and U.S. Department of Agriculture cost-share

PRODUCTS

Two newsletters with achieved goals will be written, published and mailed to area landowners biannually (totaling 8 newsletters) over the life of the project.

Agendas will be printed for workshops and tours.

A brochure will be developed and published about the watershed and the achievements.

A report on the results of two landowner meetings will be summarized.

Quarterly reports will be written (one per quarter for the life of the project).

A final project report will be submitted to the department.

Cooperators: Missouri Department of Natural Resources, the Environmental Protection Agency, AgNPS SALT, Ray County Soil and Water Conservation District (SWCD), Natural Resources Conservation Services (NRCS), Missouri Department of Conservation (MDC), Norborne School Stream Team, Carrollton High School FFA Chapter.

Sponsor: Carroll County Soil and Water Conservation District

Contact: Pat Davis
Route 1, Box 211C
Carrollton, MO 63873

Computer Assisted Nutrient Management Planning

The Spring River and Elk River Basin have been identified as having degraded watersheds due to livestock nutrient loading. The James River Basin is identified as having degradation from riparian degradation, sediment and nonpoint source pollution. The area communities derive much of their economic base from agricultural production, but the rocky terrain of the area and minimal soil depths make much of the area unsuitable for row-crop production, so residents have developed a stable economic base through dairy and beef cattle production and confinement poultry operations. The concentration of livestock and poultry numbers, combined with the poor soil conditions and lack of good management practices, allows nutrient laden manure and litter to run off area pastures and enter the waterbodies of the area. To maintain or improve the quality of life and provide economic stability for the watershed residents, nutrient management planning and implementation to reduce nonpoint source pollution from the livestock industry is essential. Nutrient management plans document work with individual producers on strategies they have developed to reduce nutrient loading due to over application or poorly managed manure spreading. Nutrient management planning efforts need to reach beyond the farmers producing the manure. Large amounts of manure can be exported from the farm that generates the manure to other farms. Spreading records of poultry growers associated with a packing plant in Sedalia Missouri indicate that over 60% of the litter produced on farms is exported. Nutrient management planning will likely lead to a higher percentage of manure being exported from the farm. Solving nutrient problems requires providing nutrient management planning opportunities to farmers receiving manure as well as farmers who generate the manure. Therefore, it is important to target both farmers with livestock and farmers that receive manure for land application on cropland, hayland or pastureland.

PROJECT DESCRIPTION

The project will focus on the development and implementation of a standardized nutrient management planning process using digital mapping resources and computer software that meets NRCS nutrient management standards and was developed by the University of Missouri and Purdue University. The project will target producers and landowners land-applying manure in a five county region in southwest Missouri for a pilot area. Lessons learned from the pilot portion of the project will be incorporated into “train-the-trainer” sessions designed to create nutrient management teams of NRCS, SWCD and UOE personnel. All individuals on the team will receive hands-on training on how to use the computer program and other digital nutrient management resources to develop accurate and efficient nutrient management plans. The project will accelerate the rate of BMP implementation because the plans use producer information and input, agency personnel will receive quality training and the computer software will increase the number and the quality of nutrient management plans written.

OBJECTIVES

Natural Resource Conservation Service (NRCS) estimates that it currently requires 150 hours to collect necessary farm operation information, write a nutrient management plan and work with the producer to implement the plan. They estimate it would take 32 full-time employees, 9 years to write nutrient management plans for all livestock and poultry operations in the state of Missouri. Farmers that receive manure also should have plans, which would require additional planning resources and time. This project will train agency personnel and private consultants to use computer-assisted processes to expedite the development of nutrient management plans for farm operations that use manure/litter as a form of plant nutrients. The project will deliver a computer-assisted model that uses producer input, technical assistance and computer based decision support for the development of realistic nutrient management plans.

The project has three phases:

- 1) develop training guide and class;
- 2) pilot the guide in the Elk, James and Spring River Basins; and
- 3) provide statewide “train-the-trainer” on-site sessions to develop resource teams throughout the state. The intent of the project is to provide computer software and other digital resources to increase the efficiency of agency personnel and private consultants developing nutrient management plans for farmers and to increase the effectiveness and quality of the plans. By using these resources, it is expected that the time necessary to write a nutrient management plan will be reduced by 50%.

Specific project objectives are as follows:

1. Implement a computer-assisted model for nutrient management planning that combines producer input, technical assistance and computerized decision support;
2. Increase producer knowledge and understanding about watersheds and water quality concerns and issues;
3. Facilitate development of nutrient management plans with farmer input to reduce nonpoint source pollution from agriculture runoff and leaching;
4. Encourage participants to implement nutrient management plans and work with local agency contacts;
5. Develop a brochure to increase awareness of the project and a website and list-serve to facilitate communication among nutrient management planners and promote discussion about resolving challenges in the nutrient management process;
6. Create a statewide network of NRCS, Soil and Water Conservation District (SWCD) and University Outreach and Extension (UOE) personnel capable of working together in nutrient management planning processes with the ability to use the tools necessary to expedite the development and implementation of nutrient management plans.

METHODS EMPLOYED

The University will:

1. Hire and supervise a Project Manager (1.0 FTE) that will develop and coordinate the nutrient management planning classes.
2. Hire and supervise a Computer/Technical Support Specialist (0.5 FTE) to support the computerized program for the pilot area and the statewide trainers as the program is implemented.
3. Ensure that all financial and progress reporting requirements are satisfactorily met.

The Project Manager will:

1. Develop materials for a manual used for the nutrient management course that will meet NRCS nutrient management planning standards.
2. Organize and present “train-the-trainer” sessions that will create a minimum of 3 training teams of 5 to 7 nutrient planners to pilot the project in the Elk River, James River and Spring River Basins (priority watersheds).
3. Work with the 3 training teams in the priority watersheds to train a minimum of 150 producers, yielding a minimum of 60 new or enhanced nutrient management plans.
4. Revise the manual and curriculum, using experience gained while working in the pilot area and the Interagency Technical Working Group as an advisory resource.
5. Develop and implement a quality assurance program to insure nutrient management plans being developed meet NRCS standards.
6. Deliver statewide “train-the-trainer” sessions to train at least 120 selected individuals organized into a minimum of 17 nutrient management planning teams statewide that will yield at least 60 new or enhanced nutrient management plans using the curriculum and the computer support.
7. Serve as a resource for the statewide teams implementing the program.

The Computer/Technical Support Specialist will:

1. Develop a supplemental manual for the trainers on how to use the computer software.
2. Provide training in the use of the nutrient management software and other digital resources.
3. Provide technical assistance to nutrient management trainers and producers using the program.
4. Resolve technical issues encountered by people using the digital nutrient management resources.
5. Create and maintain a web site for disseminating nutrient management resources and updates to the nutrient management planners and producers.
6. Create and maintain a list-serve to promote communication among nutrient management trainers and producers.

PRODUCTS

1. Project introduction brochure.
2. Training/Resource notebook.
3. Supplemental technical guidance manual.
4. List-serve and website.
5. A minimum of 120 computer assisted nutrient management plans.

Sponsor: University of Missouri-Columbia, Outreach and Extension

Cooperators: Natural Resource Conservation Service, McDonald, Barry, Newton, Jasper, and Lawrence Soil and Water Conservation Districts

Contact: University of Missouri-Columbia, Outreach and Extension
Curators of the University of Missouri, Sponsored Program Administration
University of Missouri – Columbia

310 Jesse Hall, Columbia, MO 65211
Dr. John Lory, (573) 884-7815

Hubble Creek Watershed Restoration Project

Hubble Creek watershed contains 44,875 acres of productive land in southern Cape Girardeau County, Missouri. Hubble Creek is suffering from water quality problems due to sediment. High concentrations of sediment in runoff water leave Hubble Creek and enter the Mississippi River. The sources of sediment are both agricultural and urban.

These sediment sources can be attributed to dramatic changes in the watershed's ecosystem during the last century. Changes affecting the lower reaches of Hubble Creek cause instability and headcutting. These factors allow vast amounts of sediment to remain in suspension and be delivered through the outlet and into the Mississippi. Dramatic changes in the upper reaches of the watershed greatly increase runoff to deliver higher sediment loads to the streams.

PROJECT DESCRIPTION:

This 319 funded Hubble Creek Watershed Restoration Project is the initial phase of the larger watershed improvement plan. Section 319 funds will be used to prevent nonpoint source pollution and restore water quality through the following mechanisms:

1. Offer additional incentive to CRP applicants who restore riparian buffers and establish innovative cross-corridor buffers.
2. Demonstrate the effectiveness of wetland filter areas by constructing one such area downstream from concentrated livestock operation.
3. Construct a rip-rap and sheet piling stabilization structure in a stream channel to control headcutting and stabilize streambank erosion.
4. Provide partial funding for a project manager who will manage these efforts and eligible portions of the larger Hubble Creek Watershed Improvement Plan during the term of this project.
5. Assist decision-makers in developing and implementing city and county ordinances for construction site erosion control and stormwater detention.
6. Provide partial funding for the information and education activities that are critical to this project's success.

OBJECTIVES:

A. The primary objective of this project is to restore more favorable water quality conditions within the Hubble Creek watershed. Sediment is the primary water quality problem in this watershed. The project objective is to reduce sediment load to the stream by 20%. This project will use funds from the 319 program to:

- 1). Develop and implement an information and education strategy and plan. This plan will be comprehensive and for the life of the 319 project. It will include publicizing the project's progress, monitoring and evaluation results and implementation. The plan will educate stakeholders and the public about the problems in the watershed and what services they can utilize through the project to help address problems. This will include efforts to make the stakeholders aware of the project, it's goals and who the partners and sponsors of the project are. This information and education plan will also include a process for stakeholders to have an

opportunity to contribute to and get involved in the project. Development and implementation of this plan will be the responsibility of the sponsors and their staff. This plan will be submitted to the department for review and approval.

2). Restore water quality by helping Cape Girardeau County and the city of Jackson develop and implement effective Stormwater Detention and Construction Site Erosion Control Ordinances. These ordinances and their enforcement will help control excessive runoff from new development sites in Jackson and the surrounding area. Goal will be to assist the city and county in enacting effective ordinances during the life of this project.

3). Restore riparian buffers along Hubble Creek and its tributaries. 319 funds will provide additional cost-share to supplement the Conservation Reserve Program (CRP) program for establishing riparian buffers. Currently, CRP pays 50% of the cost to establish/restore buffer strips. Participation is very low. This project will furnish an additional 25% to increase that incentive to 75%. These buffers will control erosion and remove sediment and debris as water enters and leaves the streams. Buffers will also improve aquatic habitat. Goal is to restore 20 miles of buffer strips along streams.

4). Restore water quality by establishing vegetative buffers across the flood corridors of the streams. These cross-corridor buffers will control erosion and remove sediment as flood water travel across the flood corridors. This is an innovative practice to improve water quality and wildlife habitat. A similar practice, developed with the Corps of Engineers in 1984 for Thompson Bend along the Mississippi River, has been largely successful. CRP would pay 50% to establish these strips. This project will provide another 25% for establishment. Goal is to establish 15 miles of these innovative strips across the flood corridors.

5). Demonstrate improved water quality by constructing an off-stream wetland filter area downstream from a damaging pollution site. Goal is to establish one wetland filter area of 5 acres.

6). Demonstrate the effectiveness of a rip-rap and sheet piling structure in the stream channel to control headcutting and streambank erosion. According to MDC stream managers, this type stabilization is necessary to stop headcutting and preserve stable streambanks before the riparian buffers can be expected to be effective. One structure needs to be constructed for demonstration and technology transfer. This type of structure has not been used in this area. Goal is to install one rip-rap and sheet piling structure.

7). Pursue other funding sources to enhance or continue the efforts to reduce nonpoint source pollution and restore water quality. The 319 funds will not be used to plan, design, promote or construct structures or practices where the primary purpose is for flood control.

8). Monitor and evaluate the 319 project's effectiveness throughout the life of the project. This will include water quality monitoring and evaluation of effectiveness of installed practices. This information will be used as a measure of success and also as a basis for any adjustments for the purpose of improvement. QAPP will be developed and in place to be used as a guide for monitoring and sampling for the project.

B. Another objective is to partially fund the broader Hubble Creek Watershed Improvement Plan. The watershed improvement plan represents a holistic approach to dealing with problems in this watershed. Other programs, other funding sources and other authorities will be required over the next several years to carry out the entire watershed improvement plan.

PRODUCTS

1. Develop and implement Information and Education Plan.
2. Install 20 miles of Riparian Buffers.
3. Install 15 miles of Cross-corridor Vegetative Buffers.
4. Implement Stormwater Detention and Construction Site Erosion Control Ordinances for Jackson and Cape Girardeau County. Goal is to limit runoff from new development not to exceed pre-development conditions according to USDA-NRCS Technical Release - 55 standards.
5. Install demonstration Wetland Filter Area.
6. Install demonstration Rip-rap and Sheet-piling Grade Stabilization Structure.
7. Pursue other funding sources to carry out Hubble Creek Watershed Improvement Project.
8. Reduce sediment loss from gully, sheet and rill, scour and streambank erosion by 20 percent in the Hubble Creek Watershed.

Sponsor: Cape Girardeau Soil and Water Conservation District

Cooperators: Cape Girardeau County Commission, City of Jackson, Missouri,
Missouri Department of Natural Resources, Missouri Department of
Conservation, USDA Natural Resources Conservation Service, USDA Farm
Services Agency

Contact: Cape Girardeau SWCD
480 W. Jackson Trail
Jackson, MO 63755-2665
(573) 243-1467

Bonne Femme Creek Watershed – Water Quality Restoration Project

Bonne Femme Watershed encompasses an area of 59,702 acres in Southern Boone County. The watershed has several Outstanding State Resource streams combined with sensitive karst areas that are vulnerable to water quality degradation. The area is close to the rapidly growing cities of Columbia and Ashland. Population growth over the last ten years has increased at a rate of 40%, and high growth rates are anticipated over the next few decades. Losing stream are common in the watershed. Surface stream water, originating from the glacial upland areas, infiltrates directly into cave streams as exemplified by the streams in Devil's Icebox and Hunter's Caves. Therefore, surface land-use and management practices have a direct impact on the water quality of the cave streams and their unique ecology. Streams within the watershed have also been shown to have fecal coliform levels in excess of current whole body contact standards. Without proper education and planning, development in the watershed will degrade the water quality of streams in the watershed. This project will build upon the planning foundation developed under previous AgNPS SALT and 319 projects.

PROJECT DESCRIPTION

During the first phase, the Southern Boone County Karst Team will update the watershed management plan by collecting data from previous 319 and salt projects, reviewing the data, and adding current water quality data. Additionally, a sub-watershed sensitivity analysis will be included in the watershed management plan. This data will be used during the second phase of the project to focus efforts on septic demonstrations, and conservation development BMP's. The first phase will also include education and outreach. Some of these efforts include website development, photo journals, newsletters and news releases, as well as presentations to local organizations, schools, and planning boards. To accomplish these objectives, the commission plans to hire a full-time urban conservationist, and form steering, policy and advisory committees.

OBJECTIVES

1. To reduce watershed degradation from future urbanization by providing technical and financial assistance to developers, builders, and property owners to encourage adoption of BMPs, through public meetings and training seminars.
2. To provide elected officials with scientifically based land-use policies through the formation of policy and citizen advisory committees.
3. To conduct monitoring of current watershed water quality conditions at 10 sites within the watershed and monitor the pollution reducing impacts of installed BMPs.
4. To provide access to stream monitoring data, research results and project information to watershed residents by the use of newsletters, website, and presentations.

PRODUCTS

- ✓ Update of WQMP
- ✓ Watershed Sensitivity Analysis
- ✓ QAPP
- ✓ Website
- ✓ GIS
- ✓ Watershed Database
- ✓ Handouts
- ✓ Powerpoint Presentations
- ✓ Photo Journal
- ✓ Press Releases
- ✓ Newsletters
- ✓ Cave Mapping and restoration
- ✓ Watershed Forum
- ✓ Dye Tracing Study
- ✓ Quarterly and Final Reports

Sponsor: Boone County Commission

Cooperators: MDNR, MDC, USDA-ARS, DHSS, UMC, Boone County Soil and Water Conservation District, Boone County Planning and Building Inspection
City of Columbia Planning and Zoning Department

Contact: Bill Florea

Boone County Commission
801 E. Walnut
Columbia, MO 65201-7730
(573)-886-4330

Valley Mill Lake and Watershed Restoration Project

The Valley Mill reservoir in northeast Springfield is part of the drinking water supply for the city of Springfield. The reservoir has become almost entirely silted in, and algae mats are common. The impacts of nonpoint source pollution are evident in the steambank erosion, increased sediment load, algae blooms, and sewage smell. The watershed contains several industrial complexes, a golf course, subdivisions, and the intersection of Hwy 65 and 44. The area is scheduled for increased urbanization.

PROJECT DESCRIPTION

Through this subgrant, the WCO will fund an environment assessment of the Valley Mill sub watershed. After the assessment, the WCO will target the areas of greatest sediment and nutrient contribution, and establish best management practices to reduce NPS pollution. WCO will then monitor the BMPs to determine their effectiveness. The WCO will also work with the city of Springfield to drain Valley Mill Lake, remove the sediments, and reinforce the dam. During the project, the WCO will introduce the education programs started in other sub watersheds. These include, but are not limited to, a kick-off dinner, earthday programs with school children, Show-Me Yards and Neighborhoods, and Business outreach activities sponsored by the Green County Choose Environmental Excellence Program. Finally, the WCO will plan and build a demonstration site for the community. Projects for the site include a trail, dock, wetland area, parking lot, and outdoor classroom. This will benefit the community by increased recreation, education, and watershed cohesiveness.

OBJECTIVES

1. Complete an environmental assessment of the pathways and amounts of nonpoint source pollution into the Valley Mill reservoir.
2. Develop a three stage educational program, targeting school children, businesses and landowners.
3. Restore Valley Mill reservoir and watershed
4. Create a demonstration site for the community, and
5. Create a monitoring program of the performance of restoration practices.

PRODUCTS

1. An environmental assessment of NPS pollution concentrations and pathways through the sub-watershed.
2. Area meeting will be held to disseminate information to watershed landowners, businesses, and public officials.
3. A demonstration site will be created with the construction of a dock, trails, parking facilities and an outdoor classroom.
4. Best management practices will be implemented based on the information and recommendations from the environmental assessment
5. A Quality Assurance Project Plan.

6. A final written report, including all water quality data, will be submitted to the department upon completion of the project.

Sponsor: Watershed Committee of the Ozarks, Inc

Cooperators: City Utilities of Springfield, Southwest Mo State University, Ozark Greenways, City of Springfield, Missouri Department of Conservation, and USDA

Contact: Watershed Committee of the Ozarks, Inc
320 North Main
Springfield, MO 65806
Loring Bullard (417)-855-1127

Elk River/Shoal Creek Water Quality Restoration Project

The Elk River/Shoal Creek watersheds lie within McDonald, Newton, Barry, and a small portion of Lawrence County in the southwest corner of Missouri. Streams and rivers within these watersheds are public drinking water sources and are used heavily for floating, camping, and whole body contact recreation activities. The Elk River basin has 126.5 miles of stream segments impaired due to nutrients from nonpoint source pollution from livestock production. Shoal Creek has 13.5 miles of impaired streams due to fecal coliform from unknown agricultural sources. These watersheds have experienced an increase of about 15 percent in residential population this past decade and a rapid expansion in the poultry industry. This increase in poultry production has created serious concerns about the impact on the water quality due to land application of poultry waste. Currently in the Elk River Basin there are 31 Class I poultry facilities, 116 Class II, and 37 with operations smaller than Class II with Letters of Approval based on best management practices.

PROJECT DESCRIPTION

This project will implement best management practices which include: development and implementation of comprehensive nutrient management plans (CNMPs); transport of poultry litter out of the watersheds to areas of intensive crop production; construction of poultry litter stacking sheds; tarps to prevent runoff from stored litter; pH correction of soils on farms utilizing CNMPs; piloting of livestock watering wells with rotational grazing systems; and livestock exclusion from streams. This project will be coordinated with other 319 projects in the area for outreach and education that will focus on proper nutrient management of poultry and livestock wastes.

OBJECTIVES

1. To develop Comprehensive Nutrient Management Plans (CNMPs) on 100 farms (about 15,000 acres) to prevent overapplication of nitrogen and phosphorus to soils.
2. To record the amount of litter that is being applied according to CNMPs in the watershed.
3. To increase nutrient uptake on 6,000 acres under CNMPs by correcting soils with a pH below 5.8, thus reducing nutrient runoff.
4. To construct 24 manure storage sheds to enable proper timing of nutrient application and prevent uncovered outside storage of litter. This will allow approximately 326 tons of

nitrogen and 326 tons of phosphate per year in the litter to be managed properly so risk of runoff into waterbodies is reduced.

5. To reduce runoff from 100 tons of litter per tarp (10 tarps) so litter can be temporarily stored in close proximity to an area that is in need of the nutrients. This will aid in management of 2.5 tons of nitrogen and 2.5 tons of phosphate/tarp/use. The tarps will be used in a watershed not listed for nutrients on the 303d list.
6. To demonstrate the feasibility of transporting 3,200 tons of litter containing approximately 80 tons of nitrogen and 80 tons of phosphate out of the watershed.
7. To protect streams from sedimentation and fecal contamination from livestock on 20 farms or 5 miles of stream.
8. To construct wells to supply water for managed grazing systems when this is the least cost and most environmentally beneficial option for livestock drinking water.
9. To hire a project coordinator, technician, and clerk to accomplish the above objectives.
10. To contact landowners with current animal waste plans for review and update to CNMPs on 50 farms.
11. To promote the goals and successes of the Elk River/Shoal Creek Water Quality Restoration Project to the media and to the public through the current Elk River Water Quality Demonstration 319 Project.
12. To aid in quantification of the nutrient problem in the watershed through compilation of soil and litter analyses.
13. To provide progressive photographic documentation of all tasks listed in milestones. At minimum this would include photos of “before and after” installation of BMPs.

PRODUCTS

Expected products will include 150 comprehensive nutrient management plans; 24 manure storage sheds, pH correction on 6,000 acres; 10 litter storage tarps; feasibility study of litter transport to intensive crop production areas in need of nitrogen and phosphate fertilizers; 20 livestock watering wells in combination with rotational grazing systems; compilation of soil and litter analyses as an indicator of quantification of the nutrient problem in the watersheds; exclusion fencing on 5 miles of riparian corridor; and photographic documentation of all the tasks included in the milestones.

Sponsor: McDonald County Soil and Water Conservation District

Cooperators: Missouri Department of Natural Resources, USDA Natural Resources Conservation Service, Missouri Department of Conservation, the Southwest Missouri RC&D, Simmons Foods, Inc., Tyson Foods, Inc., Willow Brook Foods, Inc., MOARK Productions, Inc., Butterball Turkey Company, George's Inc., and the University of Missouri “Education/Information to Reduce Water Pollution and Increase Management Practices Utilized by Livestock and Poultry Producers in Southwest Missouri” 319 project.

Contact: McDonald County Soil and Water Conservation District
1900 South HWY. 71
Neosho, MO 64850
Lynn Jenkins, District Conservationist

Upper Reach Spring River 319 Project

The Lawrence County, Missouri, portion of the Upper Spring River Hydrologic unit is approximately 271,000 acres. The project area measures 130,598 acres and is composed of four, fourteen digit hydrologic units, and includes a small area in Barry County, Missouri. It is primarily agricultural with the dominant land use being pasture. Approximately 30 percent is forested. The watershed has a high density of poultry and cattle. Lawrence County ranks first in number of cattle in Missouri. Major tributaries in the Lawrence County portion of the Upper Spring River include upper reaches of the Upper White Oak Creek, Stahl Creek, Truitt Creek, Williams Creek, Honey creek, and Upper Center Creek. The cities of Aurora, Freistatt, Marionville, Miller, Mount Vernon, Stotts City, and Verona, Missouri are located in the basin.

There are 45 known dairy farms and 22 poultry facilities in the project area. The animal waste from these facilities poses a threat to the areas water resources, through runoff and through direct access by cattle to the streams.

PROJECT DESCRIPTION

A nutrient management specialist will be hired as the project manager to develop a formal nutrient management school curriculum. This curriculum will be implemented to educate producers in the project area. Area producers will also be involved in restoration projects for riparian buffers and wetlands, and will be educated on evaluating the condition of their streams. Financial assistance will be provided to the participants in the restoration activities and for those that construct animal waste facilities. Stream teams will collect data in selected locations during the project period. Field days and tours will demonstrate the best management practices used by the landowners that participate in this project.

OBJECTIVES

1. To develop and apply sound comprehensive nutrient management plans for livestock feeding operations in the project area.
2. To provide for restoration of riparian corridor.
3. To provide for restoration of wetlands.
4. To increase awareness and educate landowners and producers about ways to reduce nonpoint sources of pollution from entering the creeks and streams, through the use of best management practices.

PRODUCTS

A Quality Assurance Project Plan (QAPP) for testing and monitoring activities, three nutrient management schools, two new Stream Teams, 5 producers trained in the use of Stream Visual Assessment Protocol (SVAP), restoration of 25 acres of wetland, protection of 20 miles of riparian corridor, development and follow-up on 50 comprehensive nutrient management plans (CNMP) for producers, construction of 6 dairy waste management facilities and 10 poultry waste management facilities, 2 tours and 3 field days.

Sponsor: Lawrence County Soil and Water Conservation District

Cooperators: Missouri Department of Natural Resources, USDA Natural Resources Conservation Service, University of Missouri Outreach and Extension Service, Missouri Department of Conservation, Lawrence County Soil and Water Conservation District, Barry County Soil and Water Conservation District, Stream Teams, local livestock and dairy producers.

Contact: Lawrence County Soil and Water Conservation District
10733 Highway 39
Mt. Vernon, MO 65712
Paula Champion (417) 466-7687

North Fork Salt River Phase II: Implementation

The watershed of the North Fork of the Salt River covers 626 square miles or 400,640 acres and includes portions of the following six counties with a total population of 65,380: Adair (24,977), Macon (15,762), Monroe (9,311), Schuyler (4,170) and Shelby (6,799).

According to the United States Geological Survey (USGS), this eight-digit hydrologic unit 07110005 is made up of 44% row and close grown cropland, 42% cool season grassland, 11% forest and woodland, 1% open water and 2% other uses.

This watershed area is almost entirely in the Central Claypan Major Land Resource Area. Most of the area is a nearly level to gently sloping till plain, mantled with loess of variable thickness.

The North Fork of Mark Twain Lake is on the Missouri 1998 Section 303(d) List of Impaired Waters. Atrazine is the contaminant of concern. Other water quality concerns include high total organic carbon loads, high turbidity spikes after rainfall events and sedimentation in the lake. Since these are nonpoint source pollutants that are largely unregulated, these waters are not expected to attain established standards through currently required control technology. Without a water quality management plan, these watersheds are subject to total maximum daily load establishment.

North Fork Phase II follows a previous project worked with community leaders to develop tools and resources for watershed management issues. The effort focused on awareness of the water quality issues in the watershed and developing a model for these communities to use in developing their own management plan for the watershed. The target audience was be the community leaders in the North Fork Salt River watershed of the Mark Twain Lake and the CCWWC membership communities and counties. Among the many products resulting from this prior project was the development of a Watershed Resoration Action Strategy(WRAS). This WRAS identified areas of concern that need attention to make a difference in water quality in the watershed. North Fork Phase II will focus on those areas to demonstrate and implement BMP measures.

OBJECTIVES

Agriculture/Natural Resources Management: Install a model riparian buffer protection project on Crooked and Otter Creeks to reduce erosion and sediment loading and improve aquatic and terrestrial wildlife habitat; sponsor workshops to educate landowners/producers and natural resource professionals about Confined Animal Feeding Operations (CAFO's), lagoon

management, Certified Nutrient Management Plans (CNMP's) and riparian management systems.

Community/Watersheds: Establish a partnership with the U.S. Army Corps of Engineers (COE) at Mark Twain Lake to integrate a water festival into the on-going Environmental Education Day; sponsor a series of workshops for teachers on Projects WET, WILD, Learning Tree and the Leopold Education Project. The task force will work with an area University to secure college credits for these workshops.

Water/Wastewater: Assist a local unsewered community to find a solution to their wastewater problem; provide and sponsor a program to educate local government officials about Phase II Stormwater; and alternatives to meet future regulations.

PRODUCTS AND GOALS

Agriculture/Natural Resources Management

- 2500 feet of buffers and other structures to demonstrate effectiveness in limiting sedimentation and nutrient loading while improving aquatic and terrestrial wildlife habitat.

Using existing models, the working group calculates the reduction of sedimentation and nutrient loading to be 75 – 95% depending on buffer system design and landscape characteristics.

- Two educational workshops/seminars and/or organized events such as a field day or tour to showcase solutions developed by working group.

The goals are (1) to reach 75 landowners/producers with information on developing management plans related to CAFOs, lagoon management and CNMP, and (2) to reach area natural resource management professionals on the design, installation and maintenance of buffers and to seek their input on conferences for farmers and landowners on the benefits of buffer systems.

50% of workshop participants will develop and implement management plans appropriate to their operation and 40 – 50 public and private natural resource professionals will have advanced training in buffer design, installation and maintenance that will translate into more flexible buffer designs that fit specific landscapes and landowner needs.

- A working partnership to extend beyond the life of this project.

Community/Watersheds

- Three environmental Education Days/Water Quality Festivals to involve 1000 children and 50 teachers and/or youth educators each year in the U.S. COE Environmental Education Day and University Outreach and Extension Water Festival.

The goal for this effort is that 25% of the school systems and/or youth groups in the watershed will carry out community service projects targeting nonpoint source pollution over the life of the project.

- Series of three workshops for teachers/youth educators to reach 100 educators with information on Projects WET, WILD, Learning Tree and the Leopold Educational Project. The task force will work with an area University to secure college credits for these workshops. It is expected that 60% of the participating educators will integrate some or all of the curriculum material into their classroom teaching.
- A working partnership to extend beyond the life of this project.

Water/Wastewater

- Assist a local unsewered community to find a solution to their wastewater problem. This effort will include the formation of one working citizen's committee from the target community, development of a strategy for meeting wastewater needs in one community and one manual for use by unsewered communities with similar problems.

Expected results are that the unsewered community will find a solution to their wastewater problem and the knowledge gained will be transferable to other unsewered communities.

- Sponsor workshop(s) on Phase II Stormwater regulations with the result that 75% of the counties and municipalities represented will become well versed on Phase II Stormwater Regulations and how they affect their entity.
- A working partnership to extend beyond the life of this project.

Education/Information: The North Fork Project personnel will be responsible for:

- One brochure describing the North Fork Project, WAC and working groups by issue areas.
- Nine media releases to publicize WAC and/or working group accomplishments.
- 12 quarterly Downstream newsletters to feature project information and accomplishments and provide educational information to stakeholders.
- Ten educational/informational events including workshops and/or regional watershed conferences.
- Working partnerships to extend beyond the life of this project.

Sponsor: Clarence Cannon Wholesale Water Commission

Cooperators: Mark Twain Regional Planning Commission, Missouri Department of Health, NRCS, Mark Twain Water Quality Initiative, Department of Natural Resources, Missouri Corn

Growers, University of Missouri Outreach and Extension Service, Soil and Water Conservation Districts, local county commissions, local communities.

Contact: Clarence Cannon Wholesale Water Commission
34146 Route U
Stoutsville, Mo 65283
Liz Grove, General Manager 573-672-3221

Pilot Agricultural Nonpoint Source SALT Projects

The Soil and Water Districts Commission makes available the Special Area Land Treatment (SALT) program to districts to address nonpoint source pollution issues associated with runoff from production agriculture. The SALT program is a locally led, watershed based program that allows Soil and Water Conservation Districts to target technical and financial assistance to landowners in priority watersheds for the purpose of conserving and protecting Missouri's soil and water resources.

The concept of the AgNPS SALT projects is to provide a basic level of resources to soil and water conservation districts and landowners so significant reduction and control of nonpoint source pollution can be accomplished in a targeted watershed through voluntary means. These projects are based on numerous partners contributing to a project and various tools being utilized to accomplish project goals. Through cooperative efforts, available resources and funding can be used to address nonpoint source water quality issues in Missouri.

AgNPS SALT projects are located in fifty different watersheds throughout the state as shown on the map. Boundaries of these projects are based on hydrologic units or complete topographic watersheds. Some of the projects cross county lines and are cooperatively supported by two or more local soil and water conservation districts. Watersheds range in size from approximately 17,000 acres to 99,000 acres.

AgNPS SALT projects propose to reduce or prevent agricultural nonpoint source water pollution through total resource management and adoption of recognized Best Management Practices (BMPs). The projects propose to address water quality issues by reducing chemical and nutrient runoff from cropland, improve pasture management, reduce sedimentation from agricultural land, protect and enhance riparian corridors, improve animal waste management and utilization, reduce runoff from irrigated cropland and increase awareness and understanding of agricultural nonpoint source water quality issues.

Partnerships and local leadership are key components of these voluntary projects. Some partners assisting local soil and water conservation district in development and implementation of pilot AgNPS SALT projects include local farmers, city and county governments, local agribusiness and commodity organizations, recreational organizations, volunteer stream teams, private corporations and foundations, city utilities and water districts, Missouri Department of Natural Resources, Department of Conservation, Department of Agriculture, University of Missouri and Extension Outreach, USDA Natural Resources Conservation Service, and the US EPA.

Overview of the Agricultural Nonpoint Source Special Area Land Treatment Projects (AgNPS SALT)

Barry County Soil & Water Conservation District (SWCD); UPPER SHOAL CREEK WATERSHED

This watershed area is approximately 92,000 acres with an estimated 73% grassland, 20% in forestland, 2% cropland, and 5% other. Increasing volume and improper disposal of animal waste are the greatest threat to this watershed. Another source of nonpoint pollutants is septic systems. Inadequate sewage treatment along with abandoned wells and cisterns result in effluent and contaminants entering surface or groundwater. Concerns have been expressed regarding erosion from overgrazing and poorly managed pastures. Objectives include:

- 1) educating and training landowners in nutrient management;
- 2) assisting landowners in the project area with the establishment of nutrient management systems;
- 3) improving existing or establish riparian corridor;
- 4) establishing baseline levels of nitrogen and phosphorus in streams and springs;
- 5) promoting the planting of grass species that more efficiently utilize nutrients;
- 6) increasing efficiency of nutrient use through demonstration of new litter-handling practices;
- 7) establishing baseline levels & determine safe levels of soil test phosphorus; and
- 8) increasing knowledge of pollution prevention.

Project support includes organizations, agencies and companies such as Missouri Department of Conservation (MDC), Natural Resources Conservation Service (NRCS), University of Missouri Extension, Tyson Foods, and Stream Team volunteers.

Bates County SWCD; MIAMI CREEK/DREXEL LAKE

The Miami Creek/ Drexel Lake project encompasses 80,000 acres of land, including the Butler Municipal Reservoir, Miami Creek and Drexel Reservoirs. These reservoirs supply drinking water to the cities of Butler, Drexel, Amsterdam and four public rural water supply districts serving approximately 8,500 Bates County residents. Excessive chemical, nutrient and animal wastes are problems in the reservoirs' surface and ground water tributaries. The overall goal of the pilot project is to reduce the amount of nonpoint source contaminants (Atrazine, phosphorus, and fecal coliform bacteria) from reaching the tributaries and reservoirs of the Miami Creek and Drexel Lake watersheds. The objectives include:

- 1) developing a public and landowner awareness of AgNPS pollution;
- 2) improving water quality by reducing runoff of commercial chemicals and nutrients by implementing Best Management Practices (BMPs);
- 3) reducing animal waste and associated nutrient runoff through the implementation of BMPs; and
- 4) improving the public water supply by reducing sediment load through the implementation of BMPs.

A total resource management approach will be used to protect water quality in the watershed. Cost-share and other financial incentives will be used to encourage adoption of BMPs and the application of Resource Management Systems.

Boone County SWCD; BONNE FEMME and LITTLE BONNE FEMME CREEKS

This 58,876-acre project is made up of two watersheds which drain into the Missouri River. Land cover in the watershed includes 18,068 acres of grassland, 17,787 acres of cropland, 20,035 acres of forest, and 2,968 acres of other cover. Livestock waste, herbicides, fertilizers, sediments, and stormwater runoff are major nonpoint source problems associated with agriculture in the watersheds. Poor pastures, grazing in wooded areas and around sinkholes, barnyard feedlots, streambeds accessible to livestock and row crop fields are critical sources for these contaminants. Goals for this project include: restoring riparian areas, streambanks, and small wetlands, improving invertebrate indicators of stream health in the watersheds, and reducing fecal coliform bacteria, nitrate, and pesticide contamination of streams in the watersheds. Objectives include:

- 1) adoption of Best Management Practices (BMPs) for riparian corridor improvement and management along 4.5 miles of stream;
- 2) adoption of BMPs that reduce fecal coliform bacteria, nutrients, pesticides, stormwater and/or sediment runoff from grazing land, cropland, and feedlots; and
- 3) adoption of water quality monitoring by farmers in the watersheds.

Educational activities will be designed to educate landowners, encourage adoption of BMPs and promote participation in cost-share. Project support includes organizations and agencies such as MDC, NRCS, Show-Me Clean Streams, County Health Department, and local schools.

Carroll County SWCD; TURKEY CREEK WATERSHED Protection Project

This watershed totals 62,000 acres, including 28,950 acres of cropland, 23,887 acres of grassland (includes acres enrolled in the federal Conservation Reserve Program), 9,869 acres of timber, and 97 acres of streams, ponds and wetlands. Water resources are primarily used for recreation, livestock watering, and for fish/wildlife use and habitat. Excessive herbicide, pesticide, nitrogen, phosphorus, and sediment are contributed to streams in the watershed. Several livestock operations need waste management systems and/or assistance in order to limit livestock access to streams and ponds. Water quality problems associated with row crop operations could result from the not using Best Management Practices, which, if implemented, would reduce heavy silt load contributions to Turkey Creek. Farming up to the edge of the stream banks also results in severe erosion. The overall goals of the project are to reduce sedimentation and improve water quality in Turkey Creek and its tributaries. The objectives include:

- 1) treating 75% of the CRP release ground with no-till farming;
- 2) improving waste treatment and handling facilities of each livestock operation in order to meet DNR standards;
- 3) having 60% of the crop producers using Integrated Crop Management (ICM) techniques meeting NRCS Standards and Specifications;
- 4) treating sheet and rill erosion on 60% of cropland to reach “tolerable soil loss” (“T”) levels,

- 5) treating 270 acres of gully erosion; and
- 6) informing and educating 95% of landowners in the project area about BMPs.

Cost-Share incentives may be available to producers who develop and implement plans to improve water quality. In addition, incentives may be offered to producers who use scouting and ICM techniques to properly apply correct amounts of chemicals. Other partners include NRCS, University of Missouri Extension, Ray-Carroll Cooperative, Lexington M.F.A., Conservation Technology Information Center (CTIC), and a Stream Team.

Dekalb County SWCD; CAMERON WATERSHED

The Cameron watershed, which consists of 16,671 acres of land, drains into the four public reservoirs supplying drinking water to approximately 10,000 people, including the City of Cameron, and two correctional centers. Land in the watershed is primarily grassland, or cropland. Complementary projects have previously been conducted to identify and address water quality issues in the watershed. These include an Environmental Protection Agency (EPA) Clean Lakes grant, U.S. Department of Agriculture (USDA) Water Quality Incentive Program project, a computer modeling project conducted by the Food and Agricultural Policy Research Institute (FAPRI), and an EPA 319 minigrant. The most significant issue in the watershed is the threat that Atrazine levels in water will exceed state drinking water standards. The primary objective of the project is to reduce agricultural nonpoint source pollutants to acceptable Department of Natural Resources' standards in untreated water by the year 2006. Major goals of the project are to:

- 1) lower the use of Atrazine to 50% of label rate on 6,000 acres of cropland;
- 2) reduce nutrient and sediment delivery to the reservoirs; and
- 3) provide assistance developing Integrated Crop Management (ICM) plans to landowners in the watershed.

Financial incentives will be offered through multi-year agreements to reduce use of Atrazine on corn and grain sorghum cropland.

Greene County SWCD; UPPER LITTLE SAC CREEK

This project is made up of two watersheds totaling 44,954 acres. In addition to 100 miles of streams, the watershed also includes Fulbright Springs and McDaniel Lakes, which provide public drinking water to the city of Springfield. Land use in the watershed is estimated to be 59% grassland, 23% woodland, 3% reservoirs, and 14% other uses. Concerns in the watershed include increased urban growth, stormwater runoff, nonpoint pollutants resulting from poor land management practices, and contamination of groundwater via septic systems, sinkholes and abandoned wells. The goal of the project is to protect and maintain the quality of all drinking water resources while enhancing economic sustainability for agricultural producers through education and improved land management practices. Objectives include:

- 1) improving and/or maintaining water quality and quantity;
- 2) preventing stormwater runoff and soil erosion;
- 3) improving groundwater quality;

- 4) improving quality and management of grassland and timber; and
- 5) providing public information and education.

Project support and technical assistance will be provided from a variety of agencies and organizations such as NRCS, MDC, University of Missouri Extension, City of Springfield utility companies, Southwest Missouri State University, and Stream Team volunteers.

Harrison County SWCD; SUGAR CREEK

The Sugar Creek watershed consists of 68,630 acres of land located in the Grand River Basin of northwest Missouri. The principal concern of the watershed is degradation of stream habitat and water quality within this unique, high-quality prairie stream. Factors threatening Sugar Creek include sedimentation, nutrient pollution from livestock manure and fertilizer, riparian area deforestation and agricultural pesticides. There are 10,950 acres of land needing treatment including 6,900 acres of cropland and 3,300 acres of grassland. The Topeka Shiner, a member of the minnow family and candidate for listing as “endangered” by the U.S. Fish & Wildlife Service, is found in this watershed and is experiencing a population decline. Goals of the project include:

- 1) improving water quality through establishment and maintenance of riparian buffers;
- 2) achieving soil conservation on 70% of agricultural land by reducing erosion and adoption of nutrient and pesticide management;
- 3) improving management and marketing of grass and timber; and
- 4) gaining support of landowners, farm operators, youth and community organizations for the project.

Cost-share and financial incentives will be offered to encourage adoption of Best Management Practices. Project funding is requested from various state and federal agencies including the Missouri Department of Natural Resources (DNR), Missouri Department of Conservation, United States Department of Agriculture’s Environmental Quality Incentives Program (EQIP) and the Conservation Reserve Program.

Laclede County SWCD; BRUSH CREEK ANIMAL IMPACT STUDY

The Brush Creek watershed consists of 27,071 acres of land all located in Laclede County. The primary water quality issue is the overloading of nutrients resulting from runoff laden with sediments and animal waste. Imperiled aquatic species, such as the Bluestripe Darter and the Least Darter, are found within the larger Osage Fork watershed. Goals of the project include:

- 1) improving pastureland through development of livestock water, control of undesirable vegetation, and enhancement of plant diversity;
- 2) reducing runoff velocity and increasing filtration on pasture land;
- 3) containment and application of concentrated effluent produced by small to medium dairy operations; and
- 4) improving riparian corridor management.

Cost-share and financial incentives will be offered to encourage adoption of Best Management Practices. Funding is requested from various state and federal agencies including DNR, MDC, and from USDA's Environmental Quality Incentives Program (EQIP). A 319 project is underway in the larger Osage Fork of the Gasconade watershed, which includes the Brush Creek watershed. Demonstrations and educational activities in the 319 project complement goals of the Brush Creek project.

Osage County SWCD; LOOSE CREEK WATERSHED

This 58,000-acre watershed includes communities of Linn, Loose Creek, Luystown, and Frankenstein. The watershed is comprised of approximately 53% forest, 42% grassland, 4% cropland, and 1% urban. Livestock production is the major agricultural enterprise in the watershed, with 31 swine and 18 turkey operators. Soil tests indicate that elevated nutrient levels exist in and adjacent to confined livestock operations, particularly turkey farms. This project aims to encourage operators to spread manure as fertilizer on available acres within the watershed according to a waste management plan in order to prevent nutrient buildup in any one area. Other nonpoint pollution concerns include accumulation of heavy metals in soils, nutrient buildup in soils, and economics of nutrient management. The overall goal of the project is to reduce the amount of nonpoint source contaminants (nitrogen and phosphorus) through utilization of non-structural Best Management Practices (BMPs). Objectives of the project are to:

- 1) develop a public and landowner awareness of nonpoint source pollution;
- 2) implement animal nutrient management plans and associated non-structural BMPs;
- 3) increase awareness and use of new application technology dealing with animal nutrient application;
- 4) offer cost-share practices and incentives to producers to accelerate adoption of nutrient management plans and associated BMPs; and
- 5) maintain a water quality-monitoring program to establish baseline information and track improvement to water quality.

This project complements an existing EPA 319 Nonpoint Source demonstration and education project addressing animal waste management issues. Partners in the project include local business and organizations, University of Missouri, and various state and federal agencies.

Randolph County SWCD; SILVER CREEK

This 30,700-acre watershed is a tributary of the East Fork Chariton River. Land use in the watershed is estimated to be 29% cropland, 24% woodland, 21% pastureland and 26% other. The most visible source of water quality degradation is sedimentation, which results from sheet, rill, and gully erosion on cropland, and gully erosion on pastureland. The ultimate goal of this six-year project is to educate residents so they recognize and meet their needs with limited outside assistance. Objectives of the project include:

- 1) educating and inform residents about water quality through demonstrations, newsletters, field days and one-on-one assistance;
- 2) providing information on timber management;

- 3) assisting landowners in improving pasture management;
- 4) protecting and improving riparian areas;
- 5) controlling and preventing sheet, rill, and gully erosion;
- 6) improving pesticide and nutrient management; and
- 7) improving disposal methods of farm and household waste.

Limited financial assistance will be used for specific needs.

Saline County SWCD; COW CREEK Water Quality Project

The Cow Creek watershed contains approximately 20,405 acres, 15,444 of which are highly erodible cropland. As a result, improvements in management of this cropland will be given the highest priority. Although pesticide and nutrient leaching and runoff are the main concerns, gully erosion, animal waste management, and streambank erosion will also be addressed. Incentives will be offered to producers who use Integrated Crop Management (ICM) techniques to apply correct amounts of chemicals. Producers will be encouraged to develop Total Resource Management plans that include Best Management Practices for livestock waste management, the proper use and application of pesticide and fertilizers, and the installation of erosion control practices to reduce sedimentation. Objectives for this project are to:

- 1) develop and implement 91 total resource plans;
- 2) have 10,750 acres at or below tolerable soil loss (“T”) levels;
- 3) develop 36 Total Resource Management plans with a forage legume in the rotation;
- 4) reduce gully erosion on crop and pasture to no more than one ton of soil loss per acre per year;
- 5) develop and implement approved grazing plans on 30% of pasture land;
- 6) establish or improve existing riparian corridor along 10 miles of stream;
- 7) use a reduced amount, or non-residual, herbicide on 5,000 acres of cropland;
- 8) educate 70% of operators on water quality issues; and
- 9) test 100 private drinking sources for water quality.

Stoddard County SWCD; CYPRESS DITCH

This 99,700-acre watershed contains 67,000 acres of cropland. The cropland is divided into upland areas containing over 23,000 acres of highly erodible land and 44,000 acres of fertile flatland. In addition to cropland, the watershed contains 11,000 acres of woodland, 7,597 acres of land enrolled in the federal Conservation Reserve Program, 5,500 acres of pasture, and 8,603 acres of other land use. The primary concern in the project area is pesticide and nutrient movement from agricultural lands to surface water systems, streams, and aquifers. The goals of the project are improve the quality of surface water, evaluate surface water quality after Best Management Practices (BMP) have been applied, and increase the public’s awareness of the environmental and economic benefits of water quality BMPs. Objectives include:

- 1) improving the water quality in Cypress Ditch;
- 2) treating 75% of the project area’s irrigated cropland and 20% of the area’s non-irrigated cropland with water quality BMPs;
- 3) reducing pesticide and nutrients in surface water;
- 4) participating in the Missouri Department of Natural Resources volunteer stream monitoring program, Stream Teams;

- 5) monitoring the quality of surface water in the project area;
- 6) evaluating effectiveness of water quality BMPs and surface water quality;
- 7) evaluating benefit and cost of water quality BMPs to determine economic impacts; and
- 8) conducting educational and informational activities.

Cooper County Soil and Water Conservation District (SWCD):
UPPER PETITE SALINE CREEK WATERSHED

Beginning date: January 1, 2001

Completion date: December 31, 2007

Watershed Size: 50,146 acres

Project Length: 7 years

Total Budget: \$750,000

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|----------------------------|----------------------------|----------|
| Land Use in the Watershed: | Pasture/Hayland/CRP | 49.1% |
| | Cropland | 39.25% |
| | Woodland | 11.5% |
| | Riparian corridor in trees | 91 miles |

Objectives of the AgNPS SALT project include:

1. decreasing the amount of sediment/nutrient load by developing and implementing Total Resources Management plans;
2. promoting proper waste management;
3. establishing riparian corridors or filter strips;
4. installing streambank stabilization practices;
5. providing public information and education.

Project support includes: Morgan Co. SWCD, FSA, NRCS, Cooper County Commission, MDC, Moniteau Co. SWCD, various local agri-businesses.

Greene County SWCD: MIDDLE LITTLE SAC RIVER WATERSHED

Beginning date: January 1, 2001

Completion date: December 31, 2006

Watershed Size: 71,942 acres

Project Length: 7 years

Total Budget: \$705,500

303(d) listed – agriculture - nutrients

| | | |
|----------------------------|----------------------------|-----|
| Land Use in the Watershed: | Agricultural | 50% |
| | Woodland (Privately owned) | 40% |
| | Riparian Corridor | 5% |
| | Urban | 5% |

Objectives of the AgNPS SALT project include:

1. improving and/or maintaining ground and surface water quality and quantity;
2. improving and/or maintaining pasture and grassland health;
3. improving and/or maintaining woodland health;
4. establishing and/or improving existing riparian corridor along the streams and rivers in the watershed;

5. providing public information and education support.

Project support includes: Polk County SWCD, NRCS, University Outreach & Extension, MDC, Watershed Committee of the Ozarks, Southwest Missouri State University, local stream team, Springfield City Utilities.

Holt County SWCD: SQUAW CREEK PARTNERSHIP FOR CLEAN STREAMS

Beginning date: January 1, 2001

Completion date: December 31, 2005

Watershed Size: 40,130 acres

Project Length: 5 years

Total Budget: \$750,000

UWA listed – agriculture - sediment

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| Land Use in the Watershed: | Cultivated Cropland | 70% |
| | Pasture | 13.9% |
| | Woodland | 8.9% |
| | Other | 3.9% |
| | Non-cultivated Cropland | 2.5% |
| | Public Land (MDC) | .08% |

Objectives of the AgNPS SALT project include:

1. reducing sedimentation from runoff;
2. reducing herbicide/pesticide contamination and reduction of nutrient loads in the Squaw Creek tributaries.

Project support includes: Atchison County SWCD, Nodaway County SWCD, NRCS, University Outreach and Extension, United States Geological Survey, US Fish and Wildlife Service, MDC, Missouri Corn Growers Association.

Montgomery County SWCD: ELKHORN CREEK WATERSHED

Beginning date: January 1, 2001

Completion date: December 31, 2007

Watershed Size: 62,830 acres

Project Length: 7 years

Total Budget: \$700,000

303(d) listed – agriculture - sediment

| | | |
|----------------------------|-------------------|-------|
| Land Use within Watershed: | Crop Production | 67% |
| | Woodland | 13% |
| | Pasture/Hayland | 12.6% |
| | Riparian Corridor | 2.3% |
| | Urban Development | 2.3% |
| | Roads/Farmsteads | 2% |

Objectives of the AgNPS SALT project include:

1. holding information and education meetings to make landowners and producers aware of the problems and what they can do to help;
2. conducting tours and field days to demonstrate practices that are currently being used and to encourage their use in more locations;
3. providing incentives to encourage landowners and producers to install practices as part of a total resource management plan;

4. making producers and landowners aware of what programs are currently available and what programs will be available through the AgNPS SALT through information and education meetings, field days, newsletter and newspaper articles;
5. bringing partner agencies together to provided technical assistance toward our common goal;
6. provide clerical, managerial, and technical assistance to achieve the goal.

Project support includes: University Outreach and Extension, NRCS, FSA, MDC, Loutre Quail Unlimited, Mid-Missouri Chapter Ruffed Grouse Society.

Stone County SWCD: SPRING CREEK WATERSHED

Beginning date: January 1, 2001

Completion date: December 31, 2007

Watershed Size: 27,860 acres

Project Length: 7 years

Total Budget: \$750,000

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| Land Use in the Watershed: | Pasture/hayland | 55% |
| | Woodland | 31% |
| | Urban/roads | 11% |
| | Cropland | 3% |
| | Riparian corridor | 16 miles |

Objectives of the AgNPS SALT project include:

1. decreasing sediment and nutrient loading by implementing total resource management plans;
2. promoting proper waste management to reduce pesticides, nutrients, and fecal contamination;
3. establishing and/or improving riparian corridors by fencing livestock from streams;
4. providing tours and workshops to educate and encourage better management and showcase the practices being established in the watershed.

Project support includes: Christian County SWCD, Stone County Commission, James River Basin 319 Project, University Outreach and Extension, Crane Chronicle, NRCS, Southwest Missouri RC & D, State Representative Judy Berkstresser, Reeds Spring School, Hurley School, MDC, Earth Team Volunteer Program

Benton County SWCD: DEER CREEK WATERSHED

Beginning date: July 1, 2001

Completion date: June 30, 2008

Watershed Size: 46,606 acres

Project Length: 7 years

Total Budget: \$750,000

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|----------------------------|-------------------|-----|
| Land Use in the Watershed: | Pasture | 40% |
| | Woodland | 35% |
| | Hayland | 10% |
| | FORBES Dev. | 10% |
| | Riparian Corridor | 5% |

Objectives of the AgNPS SALT project include:

1. conducting educational and informational activities to develop an awareness of non-

- point source pollution;
- 2. applying intensive grazing systems at a progressive rate;
- 3. establish Best Management Practices;
- 4. implement animal nutrient management plans;
- 5. alternative watering supplies;
- 6. install riparian buffers.

Project support includes: Benton Co. SWCD, Camden Co. SWCD, Hickory Co. SWCD, MDC, NRCS, FSA, Extension, Benton Co. Commission, Benton Co. Cattlemen's Assn., FORBES Lake of the Ozark Management Assn.

Dallas County SWCD: LINDLEY CREEK WATERSHED

Beginning date: July 1, 2001

Completion date: June 30, 2008

Watershed size: 41,165 acres

Project length: 7 years

Total Budget: \$750,000

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| Land Use in the Watershed: | Pasture/Hayland | 57% |
| | Woodland | 40% |
| | Cropland | 2% |
| | Urban | 1% |

Objectives of the AgNPS SALT project include:

- 1. decrease the amount of erosion on croplands with permanent vegetative cover;
- 2. promote nutrient management and manure transfer;
- 3. promote livestock exclusion, planned and prescribed grazing systems;
- 4. establish alternate watering systems;
- 5. promote well decommissioning.

Project support includes: Dallas Co. SWCD, Polk Co. SWCD, NRCS, FSA, MDC, DNR, Extension.

Boone County SWCD: UPPER HINKSON CREEK

Beginning date: July 1, 2001

Completion date: June 30, 2008

Watershed Size: 32,918

Project Length: 7 years

Total Budget: \$464,075

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| Land Use in the Watershed: | Cropland | 18% |
| | Grassland | 42% |
| | Woodland | 19% |
| | Urban | 20% |

Objectives of the AgNPS SALT project include:

- 1. restore riparian areas along stream banks and small wetlands;
- 2. reduce sedimentation in streams, ponds and wetlands;
- 3. reduce coliform, nitrate, and pesticide contamination of streams, ponds and wetlands.

Project supports includes: Boone Co. SWCD, NRCS, MDC, DNR, Extension, Boone Co. Commission.

Scott County SWCD: NORTH CUT

Beginning date: July 1, 2001

Completion date: June 30, 2008

Watershed Size: 65,065

Project Length: 7 years

Total Budget: \$750,000

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| Land Use in the Watershed: | Cropland | 90% |
| | Grassland | 5% |
| | Woodland | 4% |
| | Urban | 1% |

Objectives of the AgNPS SALT project include:

1. establish conservation buffers on cropland;
2. reduce over – application of irrigation water by improving system efficiencies;
3. assist with nutrient/pesticide management systems and irrigation water management systems.

Project support includes: Scott Co. SWCD, St. Johns Bayou Drainage District, MDC, NRCS, MU – Agroforestry, Extension, FSA, WESTVACO Fiber Products, Scott Co. Commission, Bootheel Resource Conservation and Development Council, local business and schools.

***Cape Girardeau County Soil and Water Conservation District (SWCD):
HUBBLE CREEK WATERSHED***

Beginning date: July 1, 2001

Completion date: June 30, 2007

Watershed Size: 44,875 acres

Project Length: 6 years

Total Budget: \$750,000

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|----------------------------|-----------------|-----|
| Land Use in the Watershed: | Pasture/Hayland | 38% |
| | Cropland | 33% |
| | Forestland | 12% |
| | Urban | 12% |
| | Rural | 5% |

Objectives of the AgNPS SALT project include:

6. To reduce erosion on highly erodible soil units.
7. Decrease the amount of sediment and nutrients entering the streams by developing and implementing total resource conservation plans within the targeted watershed.
8. Using educational programs, tours, and demonstration projects to encourage participation of landowners within the Hubble Creek watershed.
9. To introduce both new and current beneficial management practices, and encourage total resources conservation management planning.

10. To use financial incentives by use of cost-share programs to encourage Best Management Practices (BMP) including: Riparian Forest Buffers, Planned Grazing Systems, Critical Area Planting and Tree and Shrub Establishment.

Project support includes: Cape Girardeau County Commission, UOE, MDC, DNR, NRCS, FSA.

Moniteau County Soil and Water Conservation District (SWCD):

NORTH MOREAU CREEK WATERSHED

| | |
|------------------------------|---------------------------------------|
| Beginning date: July 1, 2001 | Completion date: June 30, 2008 |
| Watershed Size: 44,815 acres | Project Length: 7 years |
| Total Budget: \$750,000 | 303(d) list – municipal – waste water |

| | | |
|----------------------------|--------------------|-----------|
| Land Use in the Watershed: | Pasture/Hayland | 49% |
| | Cropland | 35% |
| | Forest/Wasteland | 8% |
| | Urban | 3% |
| | Highway/Roads | 2% |
| | Farmsteads | 2% |
| | Riparian Corridors | 132 miles |

Objectives of the AgNPS SALT project include:

1. Decrease the amount of sediment, nutrient, and pesticide load levels entering the stream by implementing Resource Management System on 5,000 acres, plus another 10,000 acres planned to T or below.
2. Promote proper waste management facilities so as to reduce the amount of nutrient and fecal contamination by implementing Nutrient Management Plans and Waste Utilization Plans on an additional 2,5000 acres not covered under RMS planning.
3. Establish or improve 240 acres of riparian corridors or filter strips along 20 miles of the stream adjacent to crop fields since these corridors are the most effective means of trapping sediment, nutrients, and pesticides.
4. Install stream bank stabilization practices on at least 15 critical sites along the stream.
5. Conduct at least two workshops or tours annually to promote or showcase the practices being established in the watershed.

Project support includes: MDC, NRCS, FSA, DNR, Morgan County SWCD, Cooper County SWCD.

Pemiscot County Soil and Water Conservation District (SWCD):

PEMISCOT BAYOU WATERSHED

| | |
|------------------------------|--------------------------------|
| Beginning date: July 1, 2001 | Completion date: June 30, 2007 |
| Watershed Size: 46,490 acres | Project Length: 6 years |
| Total Budget: \$750,000 | |

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| Land Use in the Watershed: | Cropland | 90% |
|----------------------------|----------|-----|

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|-------------|------|
| Grassland | 6% |
| Woodland | 2% |
| Open Water | 1.5% |
| Swamp/Marsh | 0.5% |

Objectives of the AgNPS SALT project include:

1. Use Residue Management to save approximately 26,000 tons of soil per year on 13,000 acres of the conventionally tilled cropland from sheet-rill and wind erosion.
2. Plant 375 acres of grass filter strips along field edges and riparian corridors to benefit 15,000 acres, reducing sedimentation and subsequently creating wildlife habitat.
3. Plant 80 acres of windbreaks to protect 1,000 acres of cropland and riparian corridors.
4. Apply nutrient and pest management techniques, according to ICM, on 13,000 acres of cropland.
5. Stop excessive gully erosion adjacent to the Pemiscot Bayou by installing structures.
6. Increase irrigation efficiency on 2,000 acres of furrow irrigated cropland.

Project support includes: NRCS, Missouri Bootheel Partners Program – Cropland Flooding Program, stream team, MDC, Caruthersville High School, Cooter High School, Delta C-7, Hayti High School, South Pemiscot High School, Southeast Missouri RD&C, Ag Distributors, Helena Chemical Company, Consolidated Public Water Supply District #1, FSA, UOE, Delta Research Center, Southern Telecommunications Center.

Pettis County Soil and Water Conservation District (SWCD):

CAMP BRANCH AND BASIN FORK WATERSHED

Beginning date: July 1, 2001

Completion date: June 30, 2008

Watershed Size: 28,750 acres

Project Length: 7years

Total Budget: \$680,000

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|----------------------------|-----------------|-----|
| Land Use in the Watershed: | Pasture/Hayland | 45% |
| | Cropland | 40% |
| | Woodland | 10% |
| | Urban | 5% |

Objectives of the AgNPS SALT project include:

1. Establish or enhance 23 miles of buffers along streams in the watershed adjoining agricultural land.
2. Reduce nutrient/sediment-loading levels on Camp Branch and Basin Fork creeks and their tributaries by establishing BMPs on 15,625 acres in the watershed.
3. Improve or create wildlife habitat in the watershed for species such as the prairie chicken by planting appropriate vegetation, maintaining existing plant cover, and by promoting the natural establishment of desirable plants such as native warm season grasses and wildlife-friendly cool season grasses.
4. Improve grassland conditions in the watershed by establishing BMPs on 7000 acres of grassland.

Project support includes: MDC, DNR, NRCS, UOE, Tyson Foods, Pettis County Commission.

Polk County Soil and Water Conservation District (SWCD):

BEAR CREEK WATERSHED

Beginning date: July 1, 2001

Completion date: June 30, 2008

Watershed Size: 40,722 acres

Project Length: 7 years

Total Budget: \$750,000

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| Land Use in the Watershed: | Pasture/Hayland | 72% |
| | Cropland | 4% |
| | Forestland | 23% |
| | Urban | 1% |

Objectives of the AgNPS SALT project include:

1. Inform and educate 90% of landowners in the project area about Best Management Practices.
2. Restore riparian corridor/livestock exclusion from streams and woodlands.
3. Organize 2 volunteer stream teams to survey macro invertebrates on a semi-annual basis to establish both baseline and project improvements in water quality.
4. To involve schools and community organizations to insure our changes are long lasting and deep rooted in the community.
5. Improve quality and management of both grassland and timber.

Project support includes: Cedar County SWCD, DNR, MDC, NRCS, USFWS, UOE, FSA, Fair Play FFA, Bolivar FFA, Quail Unlimited.

Stoddard County Soil and Water Conservation District (SWCD):

JENKINS BASIN WATERSHED

Beginning date: July 1, 2001

Completion date: June 30, 2007

Watershed Size: 46,195 acres

Project Length: 6 years

Total Budget: \$750,000

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| Land Use in the Watershed: | Urban impervious | .1% |
| | Urban vegetated | .3% |
| | Row and close grown crops | 73.0% * |
| | Cool season grassland | 15.4% |
| | Deciduous forest/woodland | .1% |
| | Deciduous woodland | 1.3% |
| | Deciduous forest | 5.2% |
| | Bottomland hardwood forest | 4.3% |
| | Swamp | 0.0% |
| | Marsh/wet herbaceous vegetation | .1% |

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|------------------------------------|-------|
| Open Water | .2% |
| *Furrow irrigated – Stoddard | 25.2% |
| *Pivot irrigated – Stoddard | 8.8% |
| *Furrow irrigated – Cape Girardeau | 1.3% |
| *Pivot irrigated – Cape Girardeau | .3% |

Objectives of the AgNPS SALT project include:

1. Protect and improve the quality of ground and surface water in the watershed through resource management plans.
2. Quantify the impact of the Jenkins Basin AgNPS SALT Project on surface and ground water quality.
3. Increase the public's awareness of the environmental and economic benefits of water quality BMPs.

Project support includes: MDC, NRCS, Stoddard County NRCS Irrigation Office, Dexter Field Office, University of Missouri - Columbia, Cape Girardeau SWCD, Southeast Missouri State University, Little River Drainage District, UOE.

Wright County Soil and Water Conservation District (SWCD):

WHETSTONE CREEK WATERSHED

Beginning date: July 1, 2001

Completion date: June 30, 2008

Watershed Size: 68,040 acres

Project Length: 7 years

Total Budget: \$750,000

303(d) listed – municipal – waste water

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| Land Use in the Watershed: | Woodland | 48% |
| | Pasture/Hayland | 45% |
| | Cropland | 6% |
| | Riparian corridor | 1% |

Objectives of the AgNPS SALT project include:

1. Improve and/or maintain pasture and grassland health.
2. Establish and/or improve nutrient management systems.
3. Provide information and education support.
4. Establish and/or improve existing riparian corridor.
5. Improve and/or maintain woodland health.
6. Improve and/or maintain ground and surface water quality.
7. Increase technical assistance within the project area.

Project support includes: NRCS, MDC, FSA, Wright County Commission, UOE, Mountain Grove Wastewater Treatment Plant, Mountain Grove Bear Pack #50 - Stream Team #1190, Texas County SWCD, David Simpson - Stream Team #1506.

Carroll County Soil and Water Conservation District (SWCD):

McCROSKIE CREEK

Beginning date: July 1, 2002
Watershed Size: 43,744 acres
Total Budget: \$ 650,000

Completion date: June 30, 2009
Project Length: 7 years

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| Land Use in the Watershed: | Cropland | 56% |
| | Pasture | 28% |
| | Hayland | 9% |
| | Woodland | 6% |
| | Other | 1% |
| | Stream Miles | 98 miles |

Objectives of the AgNPS SALT project include:

11. provide information/education on best management practices,
12. advise landowners of new and different technologies,
13. address highly erodible cropland on 70% of the acreage eroding above 2T in the watershed utilizing many eligible AgNPS SALT practices, and
14. address water quality concerns on 12,450 acres of non-highly erodible land along streams and wetland areas.

Project support includes: NRCS, MDC, Ray County SWCD, Carroll County Commission, Norborne School Stream Team, Carrollton School FFA and area producers.

Hickory County SWCD: WEAUBLEU CREEK

Beginning date: July 1, 2002
Watershed Size: 39,308 acres
Total Budget: \$750,000

Completion date: June 30, 2009
Project Length: 7 years

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| Land Use in the Watershed: | Cropland | 15% |
| | Pasture | 56% |
| | Hayland | 1% |
| | Woodland | 25% |
| | Urban | 3% |
| | Stream Miles | 75 miles |

Objectives of the AgNPS SALT project include:

1. inform and educate 100% of the landowners in the watershed about best management practices,
2. restore and/or maintain 1,000 acres of native prairie,
3. restore and/or maintain ½ of the riparian corridor with livestock exclusion from streams,
4. organize a volunteer stream team through Weaubleau and Wheatland high schools,
5. publish a quarterly newsletter specifically for the SALT area,
6. organize a “Grazing Club” to give landowners the opportunity to discuss grazing systems, and

7. organize a Quails Unlimited Chapter and a National Wild Turkey Federation Chapter for the area.

Project support includes: Polk County SWCD, St. Clair County SWCD, MDC, NRCS, UOE, FSA, Quails Unlimited, National Wild Turkey Federation, USFWS, Weaubleau and Wheatland High Schools, Hickory County Commission, Hickory County Farm Bureau and Weaubleau MFA.

Mercer County SWCD: HONEY CREEK

Beginning date: July 1, 2002 Completion date: June 30, 2009

Watershed Size: 64,500 acres

Project Length: 7 years

Total Budget: \$750,000

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| Land Use in the Watershed: | Cropland | 53% |
| | Pasture | 27% |
| | Hayland | 7% |
| | Woodland | 11% |
| | Other | 2% |
| | Stream Miles | 27 miles |

Objectives of the AgNPS SALT project include:

1. reduce erosion and sedimentation in the Honey Creek watershed, and
2. improve nutrient, pest and animal waste management to a level that would remove the stream from the 303(d) list of impaired waters of Missouri.

Project support includes: Grundy County SWCD, Grundy County FSA, Mercer County FSA, Grundy County Commission, Mercer County Commission, MDC, UOE and NRCS.

Monroe County SWCD: BEE AND TURKEY CREEKS

Beginning date: July 1, 2002

Completion date: June 30, 2009

Watershed Size: 22,806 acres

Project Length: 7 years

Total Budget: \$ 750,000

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| Land Use in the Watershed: | Cropland | 55% |
| | Pasture | 24% |
| | Hayland | 8% |
| | Woodland | 13% |
| | Stream Miles | 39 miles |

Objectives of the AgNPS SALT project include:

1. reduce erosion on crop fields to 'T' or below on 75% of cropland,
2. reduce sedimentation in Mark Twain Lake by stabilizing 12 miles of streams,
3. increase and improve the acres of riparian buffers along 12 miles of stream,
4. reduce the amount of atrazine, nutrients and pesticides in the watershed through implementation of 6,250 acres of pest and nutrient management practices, and
5. develop one waste management plan on an animal waste system.

Project support includes: MDC, NRCS and UOE.

Putnum County SWCD: BLACKBIRD CREEK

Beginning date: July 1, 2002

Completion date: June 30, 2009

Watershed Size: 37,818 acres

Project Length: 7 years

Total Budget: \$750,000

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| Land Use in the Watershed: | Cropland | 7% |
| | Pasture | 34% |
| | Hayland | 34% |
| | Woodland | 14% |
| | Urban | 4% |
| | Other | 7% |
| | Stream Miles | 27 miles |

Objectives of the AgNPS SALT project include:

1. inform and educate 90% of the landowners in the watershed,
2. reduce the amount of sediment going into Lake Mahoney and Lake Thunderhead by 15%,
and
3. reduce the amount of nutrients and pesticides going into our water sources by 10%.

Project support includes: City of Unionville, Blackbird Creek Cattle Company and Lake Thunderhead Wildflower Community.

Randolph County SWCD: DARK AND SUGAR CREEKS

Beginning date: July 1, 2002

Completion date: June 30, 2009

Watershed Size: 44,467 acres

Project Length: 7 years

Total Budget: \$ 750,000

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| Land Use in the Watershed: | Cropland | 42% |
| | Pasture | 25% |
| | Hayland | 9% |
| | Woodland | 13% |
| | Urban | 1% |
| | Public | 1% |
| | Other | 9% |
| | Stream Miles | 35 miles |

Objectives of the AgNPS SALT project include:

1. assist the City of Moberly in providing an adequate supply of water for drinking and economic development, and
2. improve the quality of water entering Dark, Sugar and Sinking Creeks.

Project support includes: MDC, AEI, UOE, Missouri Lakes, City of Moberly and Randolph County Farm Bureau.

Saline County SWCD: FINNEY CREEK

Beginning date: July 1, 2002

Completion date: June 30, 2008

Watershed Size: 34,388 acres

Project Length: 6 years

Total Budget: \$750,000

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| Land Use in the Watershed: | Cropland | 70% |
| | Pasture | 20% |
| | Woodland | 4% |
| | Urban | 6% |
| | Stream Miles | 30 miles |

Objectives of the AgNPS SALT project include:

1. educate and inform landowners and operators of the watershed about water quality issues and water quality best management practices, and
2. promote the adoption and implementation of best management practices.

Project support includes: MDC, UOE, NRCS and FSA.

Scotland County SWCD: LITTLE FOX CREEK

Beginning date: July 1, 2002

Completion date: June 30, 2009

Watershed Size: 38,516 acres

Project Length: 7 years

Total Budget: \$ 750,000

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| Land Use in the Watershed: | Cropland | 27% |
| | Pasture | 6% |
| | Hayland | 6% |
| | Woodland | 7% |
| | Other | 54% |
| | Stream Miles | 11 miles |

Objectives of the AgNPS SALT project include:

1. reduce sedimentation by using various eligible AgNPS SALT practices,
2. inform, educate and demonstrate control of sheet and rill erosion on cropland by using Best Management Practices, and
3. reduce sheet and rill erosion to 'T' on 75% of cropland.

Project support includes: Various Iowa SWCDs, NRCS, Fox River Ecosystem Development, Pheasants Forever, Northeast RC&D and FSA.

Stone County SWCD: CRANE CREEK

Beginning date: July 1, 2002

Completion date: June 30, 2009

Watershed Size: 53,060 acres

Project Length: 7 years

Total Budget: \$750,000

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| Land Use in the Watershed: | Cropland | 1% |
| | Pasture | 59% |
| | Hayland | 20% |
| | Woodland | 17% |
| | Public | 1% |
| | Other | 2% |
| | Stream Miles | 100 miles |

Objectives of the AgNPS SALT project include:

1. decrease the amount of sediment/nutrient loading levels entering the stream by developing and implementing total resource management plans on approximately 16,000 acres of pasture and hayland,
2. promote proper waste management as to reduce the amount of pesticides, nutrients and fecal contamination,
3. establish or improve riparian corridors and fence off streams,
4. work with 1,100 acres of road and urban areas such as road side ditches and testing wells,
5. promote or showcase practices being implemented in the watershed through information/education activities such as workshops and tours, and
6. conduct one grazing school for a landowner in the AgNPS SALT area.

Project support includes: Reeds Spring Stream Team, City of Crane, MRCS, MDC, Stone County UOE, SW RC&D, FSA, Farm Credit Service, Earth Team volunteers, Judy Berstresser, County Commission, Stone County Publishing and James River Basin Partnership.

Vernon County SWCD: LOWER MARMATON RIVER

Beginning date: July 1, 2002

Completion date: June 30, 2009

Watershed Size: 35,706 acres

Project Length: 7 years

Total Budget: \$ 750,000

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| Land Use in the Watershed: | Cropland | 44% |
| | Pasture | 17% |
| | Hayland | 6% |
| | Woodland | 15% |
| | Urban | 1% |
| | Other | 17% |
| | Stream Miles | 36 miles |

Objectives of the AgNPS SALT project include:

1. to prevent further deterioration of the Marmaton River's natural health by reducing contaminants entering the river by means of sedimentation, nutrients, pesticides and animal waste.

Project support includes: NRCS, University of Missouri Cooperative Outreach Extension, MDC and Vernon County Commission.

Webster County SWCD: JAMES RIVER HEADWATERS

Beginning date: July 1, 2002

Completion date: June 30, 2009

Watershed Size: 75,356 acres

Project Length: 7 years

Total Budget: \$ 750,000

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| Land Use in the Watershed: | Cropland | 2% |
| | Pasture | 49% |
| | Hayland | 11% |
| | Woodland | 34% |
| | Urban | 2% |
| | Public | 1% |
| | Other | 1% |
| | Stream Miles | 477 miles |

Objectives of the AgNPS SALT project include:

1. improve and/or maintain ground and surface water quality and quantity,
2. improve and/or maintain grassland health,
3. improve and/or maintain quality of streams and rivers in the watershed,
4. educate and inform the Amish farmers about applicable conservation practices,
5. improve/maintain woodland health, and
6. educate and inform landowners about noxious weeds in project area to allow desirable plant species to provide adequate ground cover and wildlife habitat.

Project support includes: Webster County Commission, NRCS, UOE, Watershed Committee of the Ozarks, FSA, MDC, James River Basin Partnership and City Utilities.

Caldwell County Soil and Water Conservation District (SWCD):

MUDD CREEK

Beginning date: July 1, 2003

Completion date: June 30, 2010

Watershed Size: 41,499 acres

Project Length: 7 years

Total Budget: \$ 750,000

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| Land Use in the Watershed: | Cropland | 15,069 acres (36%) |
| | Pasture/Hayland | 13,807 acres (33%) |
| | CRP | 7,437 acres (18%) |
| | Urban | 772 acres (2%) |
| | Woodland | 3,961 acres (10%) |
| | Public | 0 acres |

| | |
|--------------|-----------------|
| Other | 453 acres (1%) |
| Stream Miles | 28 miles |

Objectives of the AgNPS SALT project include:

1. Improve grassland health by planning 900 acres of grazing systems, installing 660 acres of vegetative improvement or enhancement, installing 90 livestock watering supplies.
2. Improve 28 miles of streams in the watershed by educating 160 landowners about the importance of protecting the streams, installing 3 spring development practices, installing 500 acres of filter strips and field borders, and constructing 8 alternative watering systems.
3. Decrease sediment and chemical runoff from entering the streams by installing 2140 acres of terraces, constructing 36 acres of waterways, converting 125 acres of cropland to pasture, planning 800 acres of nutrient and pest management.
4. Improve and maintain woodland health by providing 5000 feet of fencing to exclude livestock from woodland.
5. Improve ground water quality by decommissioning 80 abandoned wells.

Project support includes: Carroll County SWCD, Livingston County SWCD, Ray County SWCD, City of Braymer, National FFA Organization, Braymer Area Young Farmers Organization, Caldwell County Health Center, Caldwell County Commission, NRCS, MDC and FSA.

Cass County SWCD: SOUTH GRAND RIVER

Beginning date: July 1, 2003

Completion date: June 30, 2010

Watershed Size: 49,656 acres

Project Length: 7 years

Total Budget: \$ 750,000

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| Land Use in the Watershed: | Cropland | 18,150 acres (36%) |
| | Pasture/Hayland | 24,395 acres (49%) |
| | CRP | 1,050 acres (2%) |
| | Urban | 5 acres (<1%) |
| | Woodland | 4,758 acres (10%) |
| | Public | 631 acres (1%) |
| | Other | 576 acres (1%) |
| Stream Miles | | 23 miles |

Objectives of the AgNPS SALT project include:

1. Treat 910 acres of pasture and hayland using DSP-2 and MDSP-2 Permanent Vegetative Cover Enhancement and Modified Permanent Vegetative Cover Enhancement, DSP-3 Planned Grazing System and DSP-33 Planned Grazing System with Pond.

2. Reduce nutrient and pesticide runoff on 11,602 acres by encouraging proper farm management techniques using N590 Nutrient Management, N595 Pest Management, DSL-15 No-Till System and N633 Waste Utilization.
3. Protect surface and ground water on 960 acres using N442 Irrigation System, Sprinkler.
4. Prevent sediments, nutrients and pesticides from entering water bodies using 191 acres of buffering practices. These practices include N386 Field Border, N393 Filter Strips, N391 Riparian Forest Buffer and C050 Alternative Watering System.
5. Exclude livestock from 75 acres of woodlands and riparian areas by implementing N472 Use Exclusion.
6. Install 2,000 feet of fence for woodland protection and 5,000 feet of streambank stabilization for streambank protection. These practices include DFR-5 Woodland Protection and C650 Streambank Stabilization.
7. Construct 47,100 feet of erosion control practices to minimize soil erosion off of cropland. Practices to be used include DSL-4 & 44 Terraces and Terraces with Tile and DSL-5 Diversions.
8. Address gully erosion on 5 different sites by installing one DWP-1 Sediment Retention, Erosion or Water Control Structure and five DWC-1 Water Impoundment Reservoirs.
9. Reduce erosion from 516 acres considered critical areas. Practices to be used include DWP-3 Sod Waterways, DSL-11 Permanent Vegetative Cover-Critical Areas and DSL-1 Permanent Vegetative Cover Establishment.
10. Protect ground water quality by developing one spring using N574 Spring Development and decommissioning 14 wells using N351 Well Decommissioning.
11. Construct 3 waste management systems to alleviate animal waste problems using N317 Composting Facility and N312 Waste Management System.
12. Provide assistance to transport 8,500 cubic yards of animal waste from excessive production areas to apply to agricultural land following comprehensive nutrient management criteria. The practice to be used is N634 Manure Transfer.
13. Hold 90 various information/education activities through the life of the project.

Project support includes: NRCS, FSA, MDC, Bates County SWCD, UOE, and Quail Unlimited.

Daviess County SWCD: HICKORY CREEK

Beginning date: July 1, 2003

Completion date: June 30, 2009

Watershed Size: 17,037 acres

Project Length: 6 years

Total Budget: \$ 455,621

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|----------------------------|-----------------|-------------------|
| Land Use in the Watershed: | Cropland | 7,245 acres (43%) |
| | Pasture/Hayland | 600 acres (4%) |
| | CRP | 6,547 acres (38%) |
| | Urban | 10 acres (<1%) |
| | Woodland | 2,631 acres (15%) |
| | Public | 0 acres |
| | Other | 4 acres (<1%) |
| | Stream Miles | 19 miles |

Objectives of the AgNPS SALT project include:

3. Treat 4,320 acres of cropland for excessive erosion.
4. Treat 3,700 acres of cropland for nutrient and pest management.
5. Treat 480 acres of pastureland.
6. Treat expiring CRP land by installing 32 sediment control structures, and constructing 16 ponds for water supply.
7. Protect the targeted stream by installing stream bank stabilization.
8. Ensure animal feeding operations meet revised water quality standards.
9. Provide outreach and education programs.
10. Develop conservation plans for all landowners.

Project support includes: MO Department of Conservation, Daviess County Commission, University Outreach & Extension, and Natural Resource Conservation Service.

Harrison County SWCD: WEST FORK OF BIG CREEK

Beginning date: July 1, 2003

Completion date: June 30, 2010

Watershed Size: 41,794 acres

Project Length: 7 years

Total Budget: \$ 750,000

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| Land Use in the Watershed: | Cropland | 10,269 acres (25%) |
| | Pasture/Hayland | 18,851 acres (45%) |
| | CRP | 4,684 acres (11%) |
| | Urban | 300 acres (1%) |
| | Woodland | 7,690 acres (18%) |
| | Public | 0 acres |
| | Other | 0 acres |
| | Stream Miles | 29 miles |

Objectives of the AgNPS SALT project include:

6. Achieve a soil erosion level of “T” on 80% of the cropland needing treatment in the project area.
7. Improve management on 4360 acres of pasture.
8. Educate and inform the landowners about the project.
9. Protect and improve 50% of the riparian corridor of the creek.
10. Reduce gully erosion by constructing 63 grade stabilization or water control & sediment control basin.
11. Complete nutrient and pesticide management plans on 2100 acres of cropland in the project area.

12. Protect the ground water in the area by decommissioning 30 abandoned wells.

Project support includes: Natural Resource Conservation Service, Farm Service Agency, MO Department of Conservation, and Ringgold County SWCD (Iowa).

Knox County SWCD: NORTH FORK OF SALT RIVER

Beginning date: July 1, 2003

Completion date: June 30, 2010

Watershed Size: 44,124 acres

Project Length: 7 years

Total Budget: \$ 750,000

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| Land Use in the Watershed: | Cropland | 16,364 acres (37%) |
| | Pasture/Hayland | 19,229 acres (44%) |
| | CRP | 3,848 acres (9%) |
| | Urban | 38 acres (<1%) |
| | Woodland | 4,563 acres (10%) |
| | Public | 0 acres |
| | Other | 82 acres (<1%) |
| | Stream Miles | 120 miles |

Objectives of the AgNPS SALT project include:

1. Reduce gully erosion by implementing 102 sites of various erosion control practices. These practices include DWC-1 Structures, DWP-1 Sediment & Water Control Structures, DSL-5 Diversions, and DWP-3 Sod Waterways.
2. Install 310 acres of buffers to serve as filters along streams and other sensitive areas. The practices used will include N386 Field Border, N393 Filter Strip, N391 Riparian Forest Buffer, N472 Use Exclusion, and C050 Alternative Water System.
3. Reduce sheet and rill erosion on 1600 acres using terrace systems (DSL-4 & DSL-44), Permanent Vegetative Cover Est. DSL-1, and DSL-8 Cropland Protective Cover.
4. Offer crop management practices such as N590 Nutrient Management, N595 Pest Management, and DSL-15 No-till systems on 8,200 acres to introduce environmentally friendly methods of management techniques.
5. Implement 7000 acres of pasture management to reduce sediment and other problems associated with grazing livestock. These practices will include DSP-3/33 Planned Grazing System and Planned Grazing System with Pond, and the MDSP-2 Modified Permanent Vegetative Cover Enhancement.
6. Protect 350 feet of streambank using C650 Streambank Stabilization.
7. Decommission 4 wells to prevent ground water contamination.
8. Hold 67 various information/education activities through the life of the project.

Project support includes: Adair County SWCD, Macon County SWCD, Shelby County SWCD, NRCS, Knox County Public Water District #1, Clarence Cannon Wholesale Water Commission, MDC, FSA, DNR, Missouri Corn Growers Association and the City of Shelbina.

Laclede County SWCD: DRY AUGLAIZE CREEK

Beginning date: July 1, 2003

Completion date: June 30, 2010

Watershed Size: 81,490 acres
Total Budget: \$ 750,000

Project Length: 7 years

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| Land Use in the Watershed: | Cropland | 300 acres (<1%) |
| | Pasture/Hayland | 54,726 acres (67%) |
| | CRP | 64 acres (<1%) |
| | Urban | 2,886 acres (4%) |
| | Woodland | 22,579 acres (28%) |
| | Public | 25 acres (<1%) |
| | Other | 910 acres (1%) |
| | Stream Miles | 42 miles |

Objectives of the AgNPS SALT project include:

3. Install erosion control practices on 1490 acres using DSL-1 Permanent Vegetative Cover Est., DSL-2 Permanent Vegetative Cover Improv. and DSL-8 Cropland Protective Cover.
4. Implement 3,190 acres of pasture management to reduce sediment, fecal coliform and other problems associated with grazing livestock. Practices will include mDSP-2 and DSP-3 Planned Grazing System.
5. Construct 5 Waste Management systems for handling livestock waste. One system will be a N317 Composting Facility and the other 4 will include N312 Waste Management Systems.
6. Protect 174 acres of riparian areas by implementing the N391 Riparian Forest Buffer, N393 Filter Strip, N472 Use Exclusion, and N725 Sinkhole Protection.
7. Encourage proper management techniques by implementing 1,700 acres of Nutrient and Waste Utilization. These practices include N590 Nutrient Management, N633 Waste Utilization and N634 Manure Transfer.
8. Protect 4,619 feet of streambank using C650 Streambank Stabilization.
9. Decommission two wells and develop two springs to protect ground water quality.
10. Offer 146 information/education activities through the life of the project.

Project support includes: NRCS, MDC, UOE and the Boy Scout Troop 58.

Macon County SWCD: LONG BRANCH

Beginning date: July 1, 2003
Watershed Size: 63,775 acres
Total Budget: \$ 750,000

Completion date: June 30, 2010
Project Length: 7 years

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| Land Use in the Watershed: | Cropland | 16,029 acres (25%) |
| | Pasture/Hayland | 15,498 acres (24%) |
| | CRP | 9,525 acres (15%) |
| | Urban | 297 acres (1%) |
| | Woodland | 15,239 acres (24%) |
| | Public | 7,187 acres (11%) |
| | Other | 0 acres |
| | Stream Miles | 245 miles |

Objectives of the AgNPS SALT project include:

1. Implement pasture management on 3,210 acres using DSP-2 Permanent Vegetative Cover Enhancement, DSP-3 Planned Grazing System, and DSP-33 Planned Grazing System with Pond.
2. Prevent excessive gully erosion by treating critical areas on 62 sites. This objective will be accomplished using DSL-11 Permanent Vegetative Cover Critical Area, DWC-1 Water Impoundment Reservoir, DWP-1 Sediment Retention and Water Control Structure, and DWP-3 Sod Waterways.
3. Reduce sheet & rill on 395 acres using DSL-1 Permanent Vegetative Cover Establishment, DSL-4 & 44 Terrace Systems and Terrace Systems with Tile, and DSL-5 Diversions.
4. Protect 23,490 feet of streambanks using the C650 Streambank Stabilization and C050 Alternative Watering Systems.
5. Address streams and other sensitive areas using 230 acres of buffers. These practices include N332 Contour Buffer Strips, N393 Filter Strips, and N391 Riparian Forest Buffers.
6. Protect 940 acres of woodland using DFR-5 Woodland Protection and N472 Use Exclusion.
7. Implement 8,360 acres of Nutrient and Pest Management to encourage landowners to use proper procedures applying nutrients and pesticides.
8. Decommission 7 wells to protect ground water quality.
9. Hold 60 activities to promote public awareness in the watershed.

Project support includes: NRCS, DNR, Macon Municipal Utilities, FSA, UMC-School of Natural Resources, MDC, Macon County Economic Development Corporation, Adair County SWCD, and Long Branch Watershed Local Steering Committee.

Maries County SWCD: UPPER BIG MARIES RIVER

Beginning date: July 1, 2003

Completion date: June 30, 2010

Watershed Size: 61,689 acres

Project Length: 7 years

Total Budget: \$ 750,000

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|----------------------------|-----------------|--------------------|
| Land Use in the Watershed: | Cropland | 118 acres (<1%) |
| | Pasture/Hayland | 33,568 acres (54%) |
| | CRP Land | 0 acres |
| | Urban | 141 acres (<1%) |
| | Woodland | 27,628 acres (45%) |
| | Public | 234 acres (<1%) |
| | Other | 0 acres |
| | Stream Miles | 315 miles |

Objectives of the AgNPS SALT project include:

4. Implement 250 acres of stream exclusion practices using N391 Riparian Forest Buffer, N472 Use Exclusion and C050 Alternative Watering Systems.
5. Reduce soil erosion on 2,080 pasture acres using grassland establishment and improvement practices. These practices include DSL-1 Permanent Vegetative Cover Establishment, DSL-

- 2 Permanent Vegetative Cover Improvement and DSP-2 Permanent Vegetative Cover Enhancement.
6. Prevent water quality degradation from cropland by establishing 10 acres of buffers such as N386 Field Borders and N393 Filter Strips.
 7. Implement 4,200 acres of management intensive grazing practices which will increase water infiltration, decrease runoff and enhance forage production. The practices that will be used include DSP-3, 33 and 333 Planned Grazing System, Planned Grazing System with Pond and Planned Grazing System with Well.
 8. Protect ground water by developing 15 springs using N574 Spring Development and decommission 10 wells using N351 Well Decommissioning.
 9. Address 25 sites of gully erosion using DWC-1 Water Impoundment Reservoirs.
 10. Protect 4,000 feet of streambank using C650 Streambank Stabilization.
 11. Install 28,000 feet of fence to exclude livestock from woodlands using DFR-5 Woodland Protection.
 12. Address erosion control on 17 critical areas. The practices to be used will by DSL-11 Critical Area Treatment and DWP-3 Sod Waterway.
 13. Hold 73 various information/education activities through the life of the project.

Project support includes: NRCS, USFWS, MDC, UOE, FSA, Osage County SWCD, Maries County Commission, City of Vienna, Conservation Federation of Missouri, Maries-Osage Cattlemen's Association, and Meramec Regional Planning Commission.

Osage County SWCD: LOWER BIG MARIES RIVER

Beginning date: July 1, 2003

Completion date: June 30, 2010

Watershed Size: 67,863 acres

Project Length: 7 years

Total Budget: \$ 750,000

| | | |
|----------------------------|-----------------|--------------------|
| Land Use in the Watershed: | Cropland | 2,664 acres (4%) |
| | Pasture/Hayland | 26,496 acres (39%) |
| | CRP | 110 acres (<1%) |
| | Urban | 135 acres (<1%) |
| | Woodland | 38,354 acres (57%) |
| | Public | 104 acres (<1%) |
| | Other | 0 acres |
| | Stream Miles | 279 miles |

Objectives of the AgNPS SALT project include:

1. Establish and improve 1,115 acres of grassland using DSL-1 Permanent Vegetative Cover Establishment, DSL-2 Permanent Vegetative Cover Improvement, DSP-2 Permanent Vegetative Cover Enhancement and DSL-11 Permanent Vegetative Cover – Critical Areas.
2. Reduce soil erosion from 300 acres of cropland using the DSL-15 No-Till Systems.
3. Establish grazing systems on 3,000 acres to enhance forage production which will increase water infiltration and decrease soil erosion and nutrient runoff. The practices to be used include DSP-3, 33 and 333 Planned Grazing System, Planned Grazing System with Pond and Planned Grazing System with Well.
4. Protect 6,000 feet of streambank using C650 Streambank Stabilization.

5. Prevent agricultural non point source pollution from entering streams by establishing 550 acres of buffering practices. These practices include C050 Alternative Watering Systems, N391 Riparian Forest Buffer and N386 Field Border.
 6. Construct 6 waste management systems to alleviate animal waste problems. This goal is comprised of five N317 Composting Facilities and one N312 Waste Management Systems.
 7. Protect ground water by developing 15 springs using N574 Spring Development and decommissioning 7 wells using N351 Well Decommissioning.
 8. Prevent gully erosion on 12 sites using DWC-1 Water Impoundment Reservoir.
 9. Reduce nutrient runoff by encouraging landowners to properly apply animal waste following comprehensive nutrient management plan standards using the N633 Waste Utilization on 3,500 acres.
 10. Provide assistance to transport 50,000 cubic yards of animal waste from excessive production areas to be applied to agricultural land following nutrient management criteria. The practice to be used is N634 Manure Transfer.
 11. Construct 12,000 feet of fence to protect woodlands from livestock use. The DFR-5 Woodland Protection practice will be used for livestock exclusion.
 12. Hold 55 various information/education activities through the life of the project.
- Project support includes: National Wild Turkey Federation, Maries County SWCD, NRCS, Conservation Federation of Missouri, MDC, USFWS, UOE, Marie-Osage Cattlemen's Association, Osage County Commission, FSA, Meramec Regional Planning Commission, DNR, and Osage Independent Pork Producers.

Ozark County SWCD: SOUTH BULL SHOALS

Beginning date: July 1, 2003

Completion date: June 30, 2010

Watershed Size: 55,386 acres

Project Length: 7 years

Total Budget: \$ 750,000

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|----------------------------|-----------------|--------------------|
| Land Use in the Watershed: | Cropland | 500 acres (1%) |
| | Pasture/Hayland | 18,184 acres (33%) |
| | CRP | 0 acres |
| | Urban | 640 acres (1%) |
| | Woodland | 22,713 acres (41%) |
| | Public | 7,556 acres (14%) |
| | Other | 5,793 acres (10%) |
| | Stream Miles | 28 miles |

Objectives of the AgNPS SALT project include:

6. Reduce erosion on 1,150 acres using erosion control practices. These practices include DSL-1 Permanent Vegetative Cover Establishment and DSL-2 Permanent Vegetative Cover Improvement.
7. Enhance pasture conditions through proper grazing management on 5,540 acres by establishing DSP-3 Planned Grazing Systems, DSP-33 Planned Grazing System with Pond and DSP-2 Permanent Vegetative Cover Enhancement.
8. Protect 1,790 acres of woodlands using DFR-4 Forest Plantation, N472 Use Exclusion and Timber Stand Improvement (Funded specifically through MDC and NRCS).

9. Construct 10,000 feet of fence to exclude livestock from woodlands and other sensitive areas using the DFR-5 Woodland Protection practice.
10. Prevent sediment and nutrient runoff by implementing 130 acres of buffering practices. These practices include N391 Riparian Forest Buffer, C050 Alternative Watering Systems and CCRP Continuous Conservation Reserve Program practices (Funded through FSA).
11. Protect 1,500 feet of streambank stabilization using C650 Streambank Stabilization practice.
12. Protect ground water quality by developing five springs using N574 Spring Development and decommissioning ten wells using N351 Well Decommissioning.
13. Prevent animal waste from entering streams by constructing two N312 Waste Management Systems.
14. Promote proper application of nutrients on 4,240 acres of pasture and hayland using the N590 Nutrient Management and N633 Waste Utilization.
15. Hold 85 various information/education activities through the life of the project.

Project support includes: NRCS, USFWS, MDC, Upper White River Basin Foundation, Ozark County Times, FSA, UOE, Quail Unlimited, Department of the Army, Lutie R-VI Accelerated School, AAA Accounting & Financial Services, Gaston's White River Resort, Gainesville Lions Club, Ozark Cattlemen's Association, Thornfield School, Gainesville FFA, and Pontiac Cove.

Shelby County SWCD: NORTH FORK SALT RIVER

Beginning date: July 1, 2003

Completion date: June 30, 2010

Watershed Size: 67,666 acres

Project Length: 7 years

Total Budget: \$750,000

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|----------------------------|-----------------|--------------------|
| Land Use in the Watershed: | Cropland | 23,698 acres (35%) |
| | Pasture/Hayland | 28,835 acres (43%) |
| | CRP | 2,675 acres (4%) |
| | Urban | 216 acres (<1%) |
| | Woodland | 11,547 acres (17%) |
| | Public | 276 acres (<1%) |
| | Other | 419 acres (1%) |
| | Stream Miles | 132 miles |

Objectives of the AgNPS SALT project include:

7. Reduce erosion on 10,000 acres of cropland by constructing 262,585 feet of terraces, and installing 37 grade stabilization or water control & sediment control basin, installing 61 acres of grass waterways.
8. Reduce the amount of atrazine, nutrients and pesticides on 1,000 acres through implementation of BMPs.
9. Develop and implement one Comprehensive nutrient management plan on an existing animal waste system.

10. Implement or install 150 acres of riparian protection by installing 100 acres of Filter Strips, implementing 25 acres of riparian forest buffer, and installing 25 acres of field borders

Project support includes: Macon Co SWCD, NRCS, FSA, NERO, Department of Defense, Clarence Cannon Wholesale Water Commission and the City of Shelby.

Warren County SWCD: CHARETTE CREEK

Beginning date: July 1, 2003

Completion date: June 30, 2010

Watershed Size: 90,562 acres

Project Length: 7 years

Total Budget: \$ 750,000

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| Land Use in the Watershed: | Cropland | 19,224 acres (21%) |
| | Pasture/Hayland | 14,081 acres (16%) |
| | CRP | 1,326 acres (1%) |
| | Urban | 22,122 acres (24%) |
| | Woodland | 31,636 acres (35%) |
| | Public | 1,408 acres (2%) |
| | Other | 756 acres (1%) |
| | Stream Miles | 298 miles |

Objectives of the AgNPS SALT project include:

1. Maintain and improve pastureland/grassland in the watershed by implementing rotational grazing on 1010 acres of grassland, and establishing or improving grassland on 1200 acres.
2. Maintain and improve water quality by providing buffers on 200 acres, assisting in cropland protection on 800 acres, installing 11,200 feet of terraces or diversions, offering nutrient & pest management plans on 1000 acres, providing waste management on 6 acres, excluding or installing riparian buffers on 2235 acres,
3. Protect surface and ground water by developing 5 springs into livestock watering, decommissioning 20 abandoned wells, constructing 39 acres of sod waterways or critical area treatment, and installing 5000 feet of stream bank protection.

Project support includes: Natural Resource Conservation Service, MO Department of Conservation, University Outreach & Extension, Loutre River Quail Unlimited, MFA, Bellflower Service and Supply Coop, and Innsbrook Corporation.

**WATERSHED IMPLEMENTATION
DNR SOIL AND WATER CONSERVATION PROGRAM**

Table 21. SPECIAL AREA LAND TREATMENT (SALT) AND EARTH WATERSHED PROJECTS

| NPS CATEGORY/ SUBCATEGORY | WATERSHED NAME START DATE | ACTIVITY | COUNTY | WATERSHED ACREAGE | WATERBODY TYPE | USE IMPAIRMENTS | POLLUTANTS |
|--------------------------------------|--|--|---------------|------------------------------|---------------------------|----------------------------|-------------------------------------|
| SALT | | | | | | | |
| 10 | Big Deer Creek 1990 | Soil erosion prevention land treatment-- terraces, grassed waterways, water impoundments, conversion of cropland to grassland, conservation tillage. | Bates | 11801 | Stream | Threatened aquatic life | Sediment Nutrients pesticides |
| 10 | Malone Creek 1990 | Soil erosion prevention land treatment-- terraces, grassed waterways, water impoundments, conversion of cropland to grassland, conservation tillage. | Bollinger | 5912 | Stream | Threatened aquatic life | Sediment nutrients pesticides |
| 10 | Crabtree Branch 1990 | Soil erosion prevention land treatment-- terraces, grassed waterways, water impoundments, conversion of cropland to grassland, conservation tillage. | Cedar | 4400 | Stream | Threatened aquatic life | Sediment nutrients pesticides |

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|----|----------------------------|--|----------------------|-------|--------|----------------------------|-------------------------------------|
| 10 | Palmer Creek 1990 | Soil erosion prevention land treatment-- terraces, grassed waterways, water impoundments, conversion of cropland to grassland, conservation tillage. | Chariton | 10227 | Stream | Threatened aquatic life | Sediment nutrients pesticides |
| 10 | Lake Creek 1990 | Soil erosion prevention land treatment-- terraces, grassed waterways, water impoundments, conversion of cropland to grassland, conservation tillage. | Chariton | 11803 | Stream | Threatened aquatic life | Sediment nutrients pesticides |
| 10 | Jordan Creek 1990 | Soil erosion prevention land treatment-- terraces, grassed waterways, water impoundments, conversion of cropland to grassland, conservation tillage. | Dade | 5500 | Stream | Threatened aquatic life | Sediment nutrients pesticides |
| 10 | Tombstone Creek 1990 | Soil erosion prevention land treatment-- terraces, grassed waterways, water impoundments, conversion of cropland to grassland, conservation tillage. | Daviess/ Harrison | 12800 | Stream | Threatened aquatic life | Sediment nutrients pesticides |
| 10 | Linn Creek 1990 | Soil erosion prevention land treatment-- terraces, grassed waterways, water | Gentry | 4300 | Stream | Threatened aquatic life | Sediment nutrients pesticides |

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|-------|-------------------------|---|----------|-------|--------|-------------------------|-------------------------------|
| | | impoundments, conversion of cropland to grassland, conservation tillage. | | | | | |
| 10 | Strate Branch 1990 | Soil erosion prevention land treatment--terraces, grassed waterways, water impoundments, conversion of cropland to grassland, conservation tillage. | Marion | 5690 | Stream | Threatened aquatic life | Sediment nutrients pesticides |
| 10 | Birdtown Hollow 1990 | Soil erosion prevention land treatment--terraces, grassed waterways, water impoundments, conversion of cropland to grassland, conservation tillage. | Ozark | 6419 | Stream | Threatened aquatic life | Sediment nutrients pesticides |
| 10 | Marlowe Creek 1990 | Soil erosion prevention land treatment--terraces, grassed waterways, water impoundments, conversion of cropland to grassland, conservation tillage. | Worth | 7877 | Stream | Threatened aquatic life | Sediment nutrients pesticides |
| 10/11 | Middle Creek 1990 | Soil erosion prevention land treatment--terraces and structures to treat active gullies. | Grundy | 4000 | Stream | Threatened aquatic life | Sediment nutrients pesticides |
| 10/11 | Trail Creek 1990 | Soil erosion prevention land treatment--terraces, conservation | Harrison | 17300 | Stream | Threatened aquatic life | Sediment nutrients pesticides |

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|----------|---------------------------------------|---|------------|------|---------|--|-------------------------------|
| | | tillage and structures to treat active gullies. | | | | | |
| 10/11 | Porter Creek 1990 | Soil erosion prevention land treatment--conservation tillage and terracing to protect Squaw Creek Wildlife Refuge. | Holt | 1961 | Wetland | Threatened recreation wildlife water, aquatic life | Sediment nutrients pesticides |
| 10/11 | Price's Branch 1990 | Soil erosion prevention land treatment--conservation tillage and terracing to protect cropland. | Montgomery | 5149 | Stream | Threatened aquatic life | Sediment nutrients pesticides |
| 10/11 | Long Grove Branch 1990 | Soil erosion prevention land treatment--conservation tillage and terracing to protect cropland. | Pettis | 7265 | Stream | Threatened aquatic life | Sediment nutrients pesticides |
| 10/11,14 | North Fabius/ Downing Lake 1990 | Soil erosion prevention land treatment--pasture management, conservation tillage and structures to prevent erosion for the protection of the Downing water supply lake. | Schuyler | 1200 | Lake | Threatened drinking water supply | Sediment nutrients pesticides |
| 10/11 | Dry Creek 1990 | Soil erosion prevention--terracing and conservation tillage. | Warren | 3488 | Stream | Threatened aquatic life | Sediment nutrients pesticides |
| 10/14 | Little Hazel Creek 1991 | Soil erosion prevention--pasture improvement and tree planting. | Adair | 5240 | Stream | Threatened aquatic life | Sediment nutrients pesticides |

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| | | | | | | | |
| 10/11 | Mace Creek 1991 | Soil erosion prevention on cropland-- terraces to protect the Amazonia levee district and Savannah City Reservoir. | Andrew | 9358 | Stream Lake | Threatened drinking water supply | Sediment nutrients pesticides |
| 10/11 | Upper Lincoln Creek 1991 | Soil erosion prevention land treatment--terracing. | Andrew | 7835 | Stream | Threatened aquatic life | Sediment nutrients pesticides |
| 10/11 | Dumas Creek 1991 | Soil erosion prevention land treatment--terracing. | Clark | 7652 | Stream | Threatened aquatic life | Sediment |
| 10/14 | West Yellow Creek trib. 1991 | Soil erosion prevention land treatment--through pasture improvement and gully stabilization structures. | Linn | 2.323 | Stream | Threatened aquatic life | Sediment |
| 10/11 | Franklin School Branch 1991 | Soil erosion prevention and water control structures for storm water storage. | Marion | 2450 | Stream | Threatened aquatic life | Sediment |
| 10/11 | Jenkins Creek 1991 | Soil erosion prevention through terracing FSA farmland. | Nodaway | 5400 | Stream | Threatened aquatic life | Sediment |
| 10/14 | Turkey Creek 1991 | Soil erosion prevention through use of warm season grasses, no-till drill and other grassland management practices. | Ozark | 6518 | Lake | Threatened fishing, boating, aquatic life | Sediment |
| 10/11 | Salt Branch 1991 | Soil erosion prevention on FSA cropland by terracing. | Saline | 2855 | Stream | Threatened aquatic life | Sediment nutrients pesticides |

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|-------------|--|--|----------|-------|------------------|---|-------------------------------|
| 10/14 | Greentop/ Queen City Lakes 1991 | Soil erosion prevention by conservation tillage, pasture management, and water control structures. | Schuyler | 2371 | Lakes | Threatened drinking water supply | Sediment nutrients pesticides |
| 10/11,12 | Upper Northcut Ditch 1991 | Prevent soil erosion through installing structures near the base of upland acres. | Scott | 4453 | Drainage ditches | Threatened aquatic life | Sediment |
| 10/11 | Clarence Watershed 1991 | Treat cropland erosion with terracing. | Shelby | 4020 | 2 lakes | Threatened drinking water supply (Clarence now buys water from Macon PWSD #1) | Sediment nutrients pesticides |
| 10/14 | Elmwood Lake 1991 | Reduce soil erosion in watershed by improving pastures and building grade stabilization structures. | Sullivan | 4237 | Lake | Threatened drinking water supply | Sediment nutrients pesticides |
| 10/11 | Crowley's Ridge 1991 | Prevent erosion by reducing rate of runoff from upland areas by installation of dry sediment structures. | Stoddard | 775 | Drainage ditches | Threatened aquatic life | Sediment nutrients pesticides |
| 10/11 | Yeatter Branch 1991 | Protect highly erodible FSA cropland using terraces. | Warren | 3799 | Stream | Threatened aquatic life | Sediment nutrients pesticides |
| 10/11,14,18 | Whetstone Creek 1991 | Erosion prevention through pasture and hayland management. Project also focuses on | Wright | 19081 | Stream | Threatened aquatic life | Sediment nutrients |

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|----------|--------------------------------|---|-----------------------------|-------|------------------|-------------------------|----------------------------------|
| | | animal waste management. | | | | | |
| 10/11 | Lower Pedlar Area 1991 | Protect highly erodible FSA cropland using terraces. | Andrew | 3989 | Stream | Threatened aquatic life | Sediment nutrients pesticides |
| 10 | Hickory Ridge 1991 | Erosion prevention by reducing rate of runoff from upland crop areas. | Stoddard/ Cape Girardeau | 8490 | Drainage ditches | Threatened aquatic life | Sediment nutrients pesticides |
| 10/11 | Contrary Creek 1992 | Soil erosion control of deep loess cropland by use of terracing and structural practices. | Buchanan | 4700 | Stream | Threatened aquatic life | Sediment nutrients pesticides |
| 10/11,14 | Lick Fork 1992 | Soil erosion control of cropland and grassland through pasture management practices and structural practices. | Caldwell/ Daviss | 5700 | Stream | Threatened aquatic life | Sediment nutrients pesticides |
| 10/11 | Little Hurricane Creek 1992 | Soil erosion prevention through the use of contouring, conservation tillage, and terracing. | Carroll | 6300 | Stream | Threatened aquatic life | Sediment nutrients pesticides |
| 10/11 | Sam's Branch 1992 | Soil erosion control through reduced tillage, filter strips, and stripcropping practices. | Dade | 3627 | Stream | Threatened aquatic life | Sediment nutrients pesticides |
| 10/14 | Tunas Branch 1992 | Soil erosion control on grassland through grass renovation, warm season grass plantings and improved grazing systems. | Dallas | 3540 | Stream | Threatened aquatic life | Sediment nutrients |
| 10/11 | Cypress Creek | Control of sheet and rill | Harrison | 11600 | Stream | Threatened | Sediment |

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|-------------|--------------------------------|---|------------|-------|---------|---|-------------------------------------|
| | 1992 | erosion on cropland through structural practices such as terracing. A side goal is reduction of sedimentation downstream. | | | | aquatic life | nutrients pesticides |
| 10/14 | Turkey Creek 1992 | Improvement of pasture and hayland to reduce grassland erosion. | Hickory | 6669 | Stream | Threatened aquatic life | Sediment nutrients pesticides |
| 10/11 | Little Turkey Creek 1992 | Soil erosion prevention through the adoption of terracing and other structural practices. This watershed is a tributary of Silver Lake, a wetland area located in the Swan Lake Wildlife Area. | Linn | 6410 | Wetland | Threatened aquatic life, wildlife water | Sediment nutrients pesticides |
| 10/11 | Little Coon Creek 1992 | Control of erosion on cropland through a combination of structural and management practices. | Montgomery | 4313 | Stream | Threatened aquatic life | Sediment nutrients pesticides |
| 10/11,14,18 | Little Maries Creek 1992 | Primary objective will be reduction of erosion on cropland and grassland using a variety of conservation practices. A secondary goal will be to improve water quality through animal waste system planning. | Osage | 18355 | Stream | Threatened aquatic life | Sediment nutrients pesticides |
| 10/11 | Beaverdam Creek | Control of erosion on cropland using non- | Pettis | 5869 | Stream | Threatened aquatic life | Sediment nutrients |

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|-------|-----------------------------------|---|----------------------|-------|--------|--|-------------------------------|
| | 1992 | structural practices will be encouraged. | | | | | |
| 10/11 | Jowler Creek 1992 | Erosion control of cropland using terracing and structural practices. | Platte | 4142 | Stream | Threatened aquatic life | Sediment nutrients pesticides |
| 10/11 | West Yellow Creek #2 1992 | Erosion control on gullies and cropland. Practices to be used will be non-structural for cropland and structural for treating gully erosion. | Sullivan | 3170 | Stream | Threatened aquatic life | Sediment nutrients pesticides |
| 10/11 | McGuire Branch 1992 | Control of erosion on cropland using structures, waterways, and terraces. | Clinton | 12160 | Stream | Threatened aquatic life | Sediment nutrients pesticides |
| 10/11 | Horse Fork 1992 | Control of erosion on cropland using structures, waterways, and terraces. | Clinton | 9600 | Stream | Threatened aquatic life | Sediment nutrients pesticides |
| 10/11 | Honey Creek 1992 | Treatment of erosion on cropland with terraces, waterways, and diversions. | Cole | 6337 | Stream | Threatened aquatic life | Sediment nutrients pesticides |
| 10/11 | Unionville City Reservoir 1992 | Reduction of gully erosion through the use of sediment retention structures. Another objective is to reduce sediment movement into the Unionville City Reservoir. | Putnam | 1839 | Lake | Threatened drinking water supply, boating aquatic life | Sediment nutrients pesticides |
| 10/11 | Four-Mile Branch 1993 | Erosion prevention by conservation tillage, contouring and terraces. | Callaway/ Audrain | 6337 | Stream | Threatened aquatic life | Sediment nutrients pesticides |
| 10/11 | Snow Branch | Combination SALT and | Carroll | 2000 | Stream | Threatened | Sediment |

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|-------|----------------------------|--|--------------------|-------|--------|--|-------------------------------------|
| | 1993 | P.L. 566 watershed project designed to prevent cropland erosion with terraces and waterways. | | | | aquatic life | nutrients pesticides |
| 10/11 | Wolf Creek 1993 | Erosion prevention by terracing and erosion control structures. | Carroll | 4274 | Stream | Threatened aquatic life | Sediment nutrients pesticides |
| 10/11 | Little Platte 1993 | Erosion prevention by modified farming practices. | Clinton/ DeKalb | 14992 | Lake | Threatened aquatic life | Sediment nutrients pesticides |
| 10/11 | Coalbank Creek 1993 | Erosion prevention of highly erodible land by treating with an intensified grazing system and woodland improvement. | Cooper | 8162 | Stream | Threatened aquatic life | Sediment nutrients pesticides |
| 10/11 | Upper Dry Creek 1993 | Control of erosion by renovation and establishing pastures by planting warm season grasses, and introduction of legumes. | Dallas | 3700 | Stream | Threatened aquatic life | Sediment nutrients pesticides |
| 10/11 | Bear Branch 1993 | Erosion prevention by protecting highly erodible cropland. | Daviess | 3865 | Stream | Threatened aquatic life | Sediment nutrients pesticides |
| 10/11 | Walnut Fork 1993 | Soil erosion control by providing technical assistance for treating cropland and improving livestock water supply. | Gentry | 11000 | Stream | Threatened aquatic life, livestock water | Sediment nutrients pesticides |

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|-------|----------------------------------|--|---------|------|--------|-------------------------|-------------------------------|
| 10/11 | Long Branch 1993 | Controlling erosion on cropland through a combination of structures and management practices. | Gentry | 9000 | Stream | Threatened aquatic life | Sediment nutrients pesticides |
| 10/11 | Hogles Creek 1993 | Primary goal is to reduce erosion on the predominate pasture and hayland by implementing a good management practice with the landowners. | Hickory | 8878 | Stream | Threatened aquatic life | Sediment |
| 10/11 | Central Kimsey Creek 1993 | Soil erosion control on the highly erodible acres by using technical assistance and good management practices. | Holt | 4448 | Stream | Threatened aquatic life | Sediment nutrients pesticides |
| 10/11 | Nichols Creek 1993 | Control of erosion on cropland by using a variety of conservation practices. A main concern is to reduce the sediment delivery downstream. | Holt | 4338 | Stream | Threatened aquatic life | Sediment nutrients pesticides |
| 10/11 | Hawkins Branch 1993 | Combining with the P.L. 566 watershed in this area to reduce the erosion in this mostly cropland watershed. | Knox | 5768 | Stream | Threatened aquatic life | Sediment nutrients pesticides |
| 10/11 | Little Troublesome Creek 1993 | This area's goal is completing the required land treatment above the proposed structure sites in their P.L. 566 watershed. | Knox | 2463 | Stream | Threatened aquatic life | Sediment nutrients pesticides |

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|-------|---------------------------|---|--------------------|-------|--------|-------------------------|-------------------------------------|
| 10/11 | Bear Branch 1993 | Control runoff in predominately grassland, by treating the project area with various conservation practices. | Linn | 5179 | Stream | Threatened aquatic life | Sediment |
| 10/11 | Wildcat Creek 1993 | Control erosion by targeting pasture improvement practices. Promoting good management by sponsoring a conservation demonstration on the FFA farm. | Mercer | 3250 | Stream | Threatened aquatic life | Sediment |
| 10/11 | Bear Creek 1993 | Erosion control of cropland by using a variety of management practices and treatments. | Montgomery | 5700 | Stream | Threatened aquatic life | Sediment nutrients pesticides |
| 10/11 | Straight Branch 1993 | Erosion control on cropland by using residue management incentives. | Ralls | 4784 | Stream | Threatened aquatic life | Sediment nutrients pesticides |
| 10/11 | Burnt Fork 1993 | Soil erosion awareness through a demonstration area to promote conservation for cropland and pasture. | Ray | 4431 | Stream | Threatened aquatic life | Sediment |
| 10/11 | West Yellow Creek 1993 | Control gully erosion through water impoundment structures and sediment basins. | Sullivan | 10638 | Stream | Threatened aquatic life | Sediment |
| 10/11 | Big Rock Creek 1993 | Erosion control practices focusing on cropland. | Worth/ Harrison | 8770 | Stream | Threatened aquatic life | Sediment nutrients pesticides |

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|-------|-----------------------------|---|---------|-------|--------|-------------------------|-------------------------------|
| 10/11 | Clark Creek 1993 | Erosion control will be addressed by forage Improvement and livestock restriction. Stabilization of stream bank erosion will also be addressed. | Wright | 16252 | Stream | Threatened aquatic life | Sediment nutrients |
| 10/11 | Big Bear 1994 | Erosion prevention in the watershed. | Adair | 30323 | Stream | Threatened aquatic life | Sediment |
| 10/11 | Agee Creek 1994 | Protect highly erodible cropland by using good management practices. | Andrew | 6071 | Stream | Threatened aquatic life | Sediment nutrients pesticides |
| 10/11 | Long Branch Creek 1994 | Control highly erodible cropland acres by using erosion control practices. | Andrew | 4864 | Stream | Threatened aquatic life | Sediment nutrients pesticides |
| 10/11 | Turkey & Bass Creek 1994 | Soil erosion control on predominately cropland through a variety of good management practices. | Boone | 13415 | Stream | Threatened aquatic life | Sediment nutrients pesticides |
| 10/11 | Callaway Branch 1994 | Soil erosion control practices by use of terraces, waterways, and erosion control structures. | Carroll | 2657 | Stream | Threatened aquatic life | Sediment |
| 10/11 | Upper Alder Creek 1994 | Erosion control practices include establishing warm season grasses and rotational grazing. A secondary goal is to enhance the prairie chicken | Cedar | 5650 | Stream | Threatened aquatic life | Sediment |

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|-------|-------------------------|---|-----------|-------|--------|-------------------------|-------------------------------|
| | | habitat. | | | | | |
| 10/11 | Logans Creek 1994 | Control erosion by pasture, cropland and woodland improvement. | Cole | 5400 | Stream | Threatened aquatic life | Sediment nutrients |
| 10/11 | Gray's Creek 1994 | Primary objective will be reduction of erosion on cropland, pasture and woodland using technical assistance. | Cole | 14900 | Stream | Threatened aquatic life | Sediment nutrients pesticides |
| 10/11 | Ingalls Creek 1994 | Erosion control by improving forages, livestock watering facilities, and fencing systems and promoting warm season grasses. | Dallas | 3400 | Stream | Threatened aquatic life | Sediment nutrients |
| 10/11 | Second Creek 1994 | Control erosion by improving forages, livestock exclusion through fencing, introduction of warm season grasses and legumes, and reduce soil loss on cropland. | Gasconade | 32430 | Stream | Threatened aquatic life | Sediment nutrients |
| 10/11 | Sugar Creek 1994 | Control sheet and gully erosion through demonstrations, increased information and additional technical assistance. | Harrison | 19020 | Stream | Threatened aquatic life | Sediment |
| 10/11 | Bellevue Valley 1994 | Control erosion on predominately pasture and woodland by | Iron | 12463 | Stream | Threatened aquatic life | Sediment |

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|-------|---------------------------|--|------------|-------|--------|-------------------------|-------------------------------------|
| | | implementing good management practices. | | | | | |
| 10/11 | Little Lead Creek 1994 | Control erosion on cropland and pastures by promoting no-till seeding for crop establishment and enhancement. | Lincoln | 6628 | Stream | Threatened aquatic life | Sediment nutrients pesticides |
| 10/11 | Hickory Branch 1994 | Soil erosion control practices by use of terraces, waterways, and erosion control structures. | Linn | 6092 | Stream | Threatened aquatic life | Sediment nutrients pesticides |
| 10/11 | Blackwell Creek 1994 | Soil erosion control practices by use of terraces, waterways, and erosion control structures. | Livingston | 6033 | Stream | Threatened aquatic life | Sediment nutrients pesticides |
| 10/11 | Greasy Creek 1994 | Soil erosion control practices by use of terraces, waterways, and erosion control structures. | Madison | 11319 | Stream | Threatened aquatic life | Sediment |
| 10/11 | Hawkins Branch 1994 | Control erosion, improve water quality, minimize flooding and decrease siltation through use of various soil conservation practices. | Marion | 6175 | Stream | Threatened aquatic life | Sediment |
| 10/11 | Big Branch | Control erosion, improve water quality, minimize flooding and decrease siltation by constructing water, sediment and | Marion | 6790 | Stream | Threatened aquatic life | Sediment |

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|-------|-----------------------------------|--|-----------|-------|--------|-------------------------|-------------------------------------|
| | | erosion control structures. | | | | | |
| 10/11 | Irwin Creek 1994 | Soil erosion control through construction of terraces. | Mercer | 6410 | Stream | Threatened aquatic life | Sediment |
| 10/11 | Contrary Creek 1994 | Install management practices to decrease sediment delivery into the creek. | Osage | 10036 | Stream | Threatened aquatic life | Sediment |
| 10/11 | Brush Creek 1994 | Control erosion through pasture planting and improvement, gully and sediment control structures, terraces, conservation tillage, and wildlife habitat improvement. | Schuyler | 2880 | Stream | Threatened aquatic life | Sediment nutrients pesticides |
| 10/11 | Little Caney Creek 1994 | Install 30 grade stabilization structures to control gully erosion and retain sediment. | Scott | 6337 | Stream | Threatened aquatic life | Sediment |
| 10/11 | North Fork of Gallinipper 1994 | Control erosion on pasture, cropland and timber through conservation practices. | St. Clair | 5182 | Stream | Threatened aquatic life | Sediment |
| 10/11 | Peachtree Fork 1994 | Prevent soil erosion in woodland through livestock exclusion. Control gully erosion using water impoundment in cropland and woodland. | Wayne | 6335 | Stream | Threatened aquatic life | Sediment nutrients |
| 10/11 | Lower Marlowe Creek | Control gully erosion through structure | Worth | 8024 | Stream | Threatened aquatic life | Sediment |

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|-------|------------------------------|--|-----------|-------|--------|-------------------------|-------------------------------|
| | 1994 | Installation. | | | | | |
| 10/11 | Wolf Creek 1994 | Pastureland and hayland improvement. | Wright | 23830 | Stream | Threatened aquatic life | Sediment nutrients |
| 10/11 | Pyletown 1994 | Install grade stabilization structures, rotational grazing, reduced tillage, crop rotation, and residue maintenance. | Stoddard | 3990 | Stream | Threatened aquatic life | Sediment nutrients pesticides |
| 10/11 | Dry Creek 1994 | Install sediment and erosion control structures and complete resource management systems for cropland, pasture and woodland. | Bollinger | 8853 | Stream | Threatened aquatic life | Sediment nutrients pesticides |
| 10/11 | Upper Long Branch 1994 | Use no-till farming particularly on highly erodible land. | Boone | 6075 | Stream | Threatened aquatic life | Sediment nutrients pesticides |
| 10/11 | North Contrary Creek 1994 | Implement good conservation management Practices. | Buchanan | 2878 | Stream | Threatened aquatic life | Sediment |
| 10/11 | Garrettsburg 1995 | Erosion and flood control by increasing pasture and grassland quality through good management practices. | Buchanan | 4505 | Stream | Threatened aquatic life | Sediment nutrients |
| 10/11 | Sugar Creek 1995 | Control erosion on highly erodible cropland by contour farming and good management practices. | Buchanan | 3668 | Stream | Threatened aquatic life | Sediment nutrients |
| 10/11 | Little Otter Creek | Control erosion through technical assistance with | Caldwell | 5585 | Stream | Threatened aquatic life | Sediment |

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| | 1995 | planning and management of planned grazing systems. | | | | | |
| 10/11 | Jones Branch 1995 | Install erosion control structures and improve forage quality. | Chariton | 7909 | Stream | Threatened aquatic life | Sediment |
| 10/11 | Goff Creek 1995 | Establish good grazing systems and promote better grazing management. | Christian | 3231 | Stream | Threatened aquatic life | Sediment nutrients |
| 10/11 | Dry Fork 1995 | Install planned grazing systems and management plans including livestock exclusion. | Dent | 14000 | Stream | Threatened aquatic life | Sediment nutrients |
| 10/11 | Clifty Creek 1995 | Install controlled grazing systems, forage management, no-till seeding, livestock exclusion from woodlands. | Douglas | 12749 | Stream | Threatened aquatic life | Sediment nutrients |
| 10/11 | No Creek 1995 | Control erosion with structures, terraces, waterways, critical area seedings and good management practices. | Grundy | 20996 | Stream | Threatened aquatic life | Sediment |
| 10/11 | Crooked Creek 1995 | Control erosion with structures, terraces, contouring, and improving pasture and hay land with no-till. | Grundy | 6289 | Stream | Threatened aquatic life | Sediment |
| 10/11 | Upper White Oak Creek 1995 | Provide technical assistance and promote use of no-till drill. | Harrison | 12165 | Stream | Threatened aquatic life | Sediment |
| 10/11 | Crane Creek | Implement rotational | Hickory | 11067 | Lake | Threatened | Sediment |

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|-------|---------------------|---|------------|-------|--------|-------------------------|-------------------------------|
| | 1995 | grazing, improved forage systems and streambank erosion control. | | | | aquatic life | nutrients |
| 10/11 | Davis Creek 1995 | Control sheet and gully erosion by constructing water impoundments and reservoirs throughout the watershed. | Holt | 8074 | Stream | Threatened aquatic life | Sediment |
| 10/11 | Hickory Creek 1995 | Prevent soil erosion and chemical runoff to the Nodaway River by using a variety of conservation practices. | Holt | 5921 | Stream | Threatened aquatic life | Sediment pesticides nutrients |
| 10/11 | Elkhorn Branch 1995 | Pasture and hayland improvement. | Howell | 3974 | Stream | Threatened aquatic life | Sediment nutrients |
| 10/11 | Elk Creek 1995 | Install terraces, waterways, structures, seeding and interseeding. | Linn | 12633 | Stream | Threatened aquatic life | Sediment |
| 10/11 | Coon Creek 1995 | Use contouring and no-till. | Livingston | 5171 | Stream | Threatened aquatic life | Sediment |
| 10/11 | Village Creek 1995 | Improved pasture and hayland and livestock exclusion to reduce erosion. | Madison | 7680 | Stream | Threatened aquatic life | Sediment nutrients |
| 10/11 | Bear Creek 1995 | Use of crop residue management, no-till planting systems, critical area seeding, and mechanical practices to reduce erosion and runoff from cropland. | Marion | 9160 | Stream | Threatened aquatic life | Sediment nutrients pesticides |

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|-------|--|--|------------|-------|--------|-------------------------|--------------------|
| 10/11 | Lick Creek 1995 | Improved pasture management, no-till planting systems, critical area seeding, and mechanical practices to reduce erosion and runoff from cropland. | Marion | 6500 | Stream | Threatened aquatic life | Sediment nutrients |
| 10/11 | Brush Creek 1995 | Promote better cropland and pasture management practices. | Mercer | 6700 | Stream | Threatened aquatic life | Sediment nutrients |
| 10/11 | Clear Fork 1995 | Erosion control using minimum- and no-till. Promote intensive grazing and other conservation practices. | Montgomery | 16640 | Stream | Threatened aquatic life | Sediment nutrients |
| 10/11 | E. Branch Jenkins 1995 | Erosion control using waterways, structures, sediment basins, terraces and seeding. | Nodaway | 3784 | Stream | Threatened aquatic life | Sediment |
| 10/11 | E. Branch Elkhorn 1995 | Erosion control using waterways, structures, sediment basins, terraces, seeding and alternative livestock water sources. | Nodaway | 5340 | Stream | Threatened aquatic life | Sediment nutrients |
| 10/11 | Swan Creek/ Graveyard Branch 1995 | Reduced runoff and sedimentation by increasing grassland management, improved animal waste management and timber management. | Osage | 10287 | Stream | Threatened aquatic life | Sediment nutrients |
| 10/11 | Panther Creek 1995 | Reduce soil loss using terraces, waterways, | Polk | 7450 | Stream | Threatened aquatic life | Sediment nutrients |

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| | | contouring, strip cropping, minimum tillage, no-till and livestock exclusion. | | | | | |
| 10/11 | Little Locust Creek 1995 | Erosion control and water quality protection through promotion of rotational or management intensive grazing and livestock exclusion from woodland. | Putnam | 8970 | Stream | Threatened aquatic life | Sediment nutrients |
| 10/11 | Turkey Creek 1995 | Erosion control and water quality protection through promotion of rotational or management intensive grazing and livestock exclusion from woodland. | Putnam | 7880 | Stream | Threatened aquatic life | Sediment nutrients |
| 10/11 | Hays Creek 1995 | Controlled grazing, residue management and other erosion control practices. | Ralls | 6625 | Stream | Threatened aquatic life | Sediment |
| 10/11 | Turkey Creek 1995 | Good residue management for erosion control on cropland. | Ralls | 3165 | Stream | Threatened aquatic life | Sediment |
| 10/11 | Fish Creek 1995 | Erosion control through narrow-base terraces, grass back terraces, conservation tillage, and livestock exclusion. | Saline | 13637 | Stream | Threatened aquatic life | Sediment nutrients |
| 10/11 | North Fork Little Fabus 1995 | Erosion control with terraces, conservation tillage, and gully/sediment control structures. | Schuyler | 2942 | Stream | Threatened aquatic life | Sediment |
| 10/11 | Dry Crane Creek | Control erosion on steep slopes with seeding, | Stone | 8019 | Stream | Threatened aquatic life | Sediment |

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| | 1995 | planting trees and creek bank stabilization. | | | | | |
| 10/11 | Long Branch 1995 | Control soil erosion and protect water quality through no-till, reduced tillage, contour farming, terracing, and grade stabilization structures. | Sullivan | 4556 | Stream | Threatened aquatic life | Sediment |
| 10/11 | West Piney 1995 | Control soil erosion on woodland and pastures using no-till, livestock exclusion, streambank stabilization and good forage and woodland management. | Texas | 42880 | Stream | Threatened aquatic life | Sediment nutrients |
| 10/11 | Elk Creek 1995 | Erosion control with streambank stabilization, no-till, livestock exclusion, forage management and controlled grazing. | Wright | 30270 | Stream | Threatened aquatic nutrients | Sediment nutrients |
| 10/11,14 | Painter Creek 1995 | Erosion control and water quality protection through promotion of rotational grazing and spring development. | Macon | 3710 | Stream | Threatened aquatic life | Pesticides, nutrients |
| 10/14 | Caney Mountain | Protection of water quality through improved grassland and woodland management. | Ozark | 4090 | Stream | Threatened aquatic life | Nutrients |

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| EARTH | | | | | | | |
| 10/11 | Honey, Dog, & Marrowbone Creeks 1992 | Soil erosion prevention land treatment and gully stabilization structures. | Daviess | 61800 | Stream | Threatened aquatic life | Sediment |
| 10/11 | Troublesome Creek 1992 | Combination EARTH project and NRCS P.L. 566 watershed project designed to prevent cropland erosion through land treatment and installation of structures. | Knox | 22958 | Stream | Threatened aquatic life | Sediment |
| 10/11 | Parsons Creek 1992 | Erosion prevention by land treatment and gully stabilization structures. Creek drains into Fountain Grove Wildlife Area. | Livingston/ Linn | 63680 | Wetland | Threatened Recreation Wildlife water, aquatic life | Sediment nutrients pesticides |
| 10/11 | Wolf Creek 1992 | Erosion prevention of cropland by land treatment. | Montgomery | 10400 | Stream | Threatened aquatic life | Sediment |
| 10/11 | Cow Creek 1992 | Erosion prevention through terracing and gully stabilization structures. | Saline | 20013 | Stream | Threatened aquatic life | Sediment |
| 10/11 | Peruque Creek 1992 | Erosion prevention by terracing of cropland and installation of gully stabilization structures. | Warren | 11395 | Lake | Threatened aquatic life | Sediment nutrients pesticides |
| 10/11 | Monticello | Erosion prevention by | Lewis | 12800 | Stream | Threatened | Sediment |

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| | Basin 1992 | terracing of cropland and installation of gully stabilization structures. | | | | aquatic life | |
| 10/11 | Little Cedar Creek 1993 | Erosion control on predominate cropland and pasture by improving land management and conservation practices. | Boone | 11700 | Stream | Threatened aquatic life | Sediment |
| 10/11 | West Muddy Creek 1993 | Erosion control through farm conservation planning, gully and sediment control structures, and conservation tillage. | Mercer | 19360 | Stream | Threatened aquatic life | Sediment nutrients pesticides |
| 10/11 | Otter Creek 1993 | Decrease soil loss and improve water quality by constructing water impoundments and reservoirs within gullies. | Monroe/ Shelby | 67200 | Stream | Threatened aquatic life | Sediment |
| 10/11 | Bear Creek 1993 | Pasture improvement, livestock exclusion and timber stand improvement practices. | Scotland | 23120 | Stream | Threatened aquatic life | Sediment nutrients |
| 10/11 | Bee Branch 1994 | Erosion prevention through use of no-till, diversions, grade stabilization structures and pasture improvement. | Chariton | 20339 | Stream | Threatened aquatic life | Sediment nutrients |
| 10/11 | Big Muddy Creek 1994 | Erosion control by terraces, no-till, contour farming, conservation tillage and seeding. | Daviess | 75616 | Stream | Threatened aquatic life | Sediment nutrients pesticides |

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|-------|---------------------------|--|------------|-------|--------|-------------------------|-------------------------------|
| 10/11 | Little Third Fork 1994 | Reduced erosion, flooding and sedimentation through installation of structures and soil conservation practices. | Dekalb | 40414 | Stream | Threatened aquatic life | Sediment nutrients pesticides |
| 10/11 | Dry Fork 1994 | Installation of soil stabilization structures and grassed waterways, treatment of critical areas and pasture establishment. | Montgomery | 16200 | Stream | Threatened aquatic life | Sediment nutrients pesticides |
| 10/11 | Cedar Creek 1994 | Pasture and hayland improvement and management, livestock exclusion from woodland, installation of erosion control structures. | Osage | 33580 | Stream | Threatened aquatic life | Sediment nutrients |
| 10/11 | Shaver Creek 1994 | Erosion control through terraces, waterways, no-till systems, rotational grazing, livestock exclusion, and installation of erosion control structures. | Pettis | 19524 | Stream | Threatened aquatic life | Sediment nutrients pesticides |
| 10/11 | Bear Creek 1994 | Improved residue management and grassland management for erosion control. | Platte | 21069 | Stream | Threatened aquatic life | Sediment nutrients pesticides |
| 10/11 | Barber Creek 1994 | Erosion control through critical area treatment, water and sediment control basins and rotational grazing. | Putnam | 14721 | Stream | Threatened aquatic life | Sediment nutrients |
| 10/11 | Camp Branch | Erosion control through | Warren | 10664 | Stream | Threatened | Sediment |

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| | 1994 | waterways, terraces, no-till and critical area seeding. | | | | aquatic life | nutrients pesticides |
| 10/11 | Little Medicine Creek 1994 | Treat cropland erosion by use of no-till, terraces, and contouring, with drainageways and steep slopes seeded to grasses. | Mercer | 49670 | Stream | Threatened aquatic life | Sediment nutrients pesticides |
| 10/11,14 | Crooked Creek 1995 | Control erosion through grassland management, livestock exclusion from woodlands, and erosion control structures. | Bollinger | 30362 | Stream | Threatened aquatic life | Nutrients |
| 10/11,14 | Son's Creek 1995 | Control erosion and protect water quality through construction of terraces and waterways, conservation tillage, filter strips, crop rotation, and pasture management. Creek drains into Lake Stockton, which is primary water supply for Springfield. | Dade | 60600 | Lake | Threatened drinking water supply, aquatic life | Nutrients |
| 10/14,22 | Crane Pond Creek 1995 | Control erosion and protect water quality through forage management, streambank protection, and timber stand improvement. | Iron | 23680 | Lake | Threatened aquatic life | Sediment, nutrients |
| 10/11,14,22 | Turkey Creek 1995 | Control erosion and protect water quality through cropland management, | Linn | 18622 | Lake | Threatened recreation wildlife water, | Nutrients, pesticides, sediments |

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| | | reduced tillage practices, structural and other methods of gully treatment, livestock exclusion from riparian areas and woodland management. | | | | aquatic life, siltation | |
| 10/11,14 | Medicine Creek 1995 | Erosion control through no-till and contour cultivation, terraces, and drainageways, and structural controls on gully areas. | Mercer | 49670 | Stream | Threatened aquatic life | Sediment, nutrients, pesticides |
| 10/11,14,22 | Brush Creek 1995 | Reduce erosion on cropland, improve pasture conditions, and improve water quality through agronomic structural and non-structural practices, pasture improvement, grazing management, timber stand improvement, and stream corridor protection. | Polk | 52520 | Stream | Threatened aquatic life, particularly the Niangua Darter | Sediment, nutrients |
| 10/14,22 | McKenzie Creek 1995 | Erosion control through structural practices, pasture improvement and establishment, critical area treatment, and woodland improvement through livestock exclusion. | Wayne | 12200 | Stream | Threatened aquatic life | Sediment, nutrients |

APPENDIX J

Implementation Assistance

IMPLEMENTATION ASSISTANCE

The agencies and programs, which follow, are some of those that may be part of NPS program implementation in Missouri. The list is not intended to be either exclusive or all-inclusive. Included are existing requirements of other federal and state laws to the extent they are relevant. Addresses and telephone numbers are provided at the end of this section to obtain additional information on listed programs.

Department of Natural Resources Water Protection & Soil Conservation Division

Soil and Water Conservation Program

The Soil and Water Conservation Program (SWCP) provides staff support for the Soil and Water Districts Commission. Program activities are supported by one half of the proceeds of a one-tenth of a percent Parks and Soils sales tax in Missouri. The other half is used to maintain the state's park system. In 1984 an amendment to the constitution of Missouri, Article IV, Section 47 (a)-(c) authorized the collection of the sales tax. The soils tax programs, which operate under the authority of RSMo 278, have been in place since 1986. More than 78 percent of the soils tax goes to landowners for soil conservation.

Grants to Districts: Each of the 114 soil and water conservation districts receives grants for their operation. Uses are determined by each locally elected board and include funding for management, clerical and technical personnel; information and education programs; equipment and general administrative expenses. The districts serve as the delivery system for the state's voluntary incentive programs and other soil and water conservation efforts.

Cost-share Program: Landowners are reimbursed for installing practices that prevent or control excessive erosion on agricultural land. The practices are designed to reduce soil erosion, maintain agricultural productivity and prevent degradation of water quality in rivers and streams. Landowners must invest 25 percent or more in their projects. Practices and reimbursement rates generally complement those of USDA with some exceptions.

Loan Interest-share Program: Landowners are reimbursed for a portion of the interest paid on private loans used to finance standard soil erosion control practices or the purchase of limited tillage conservation equipment. This program is being expanded to promote total resource management for agricultural land.

Research Grants: Grants are awarded to Missouri state colleges and universities for research projects to support the goals of the Soil and Water Districts Commission. Subjects vary from agronomic to sociological as they pertain to effective conservation practices.

Soil Survey: Staff provide assistance to accelerate the completion of the state's soil survey. Soil surveys are fundamental in natural resource documentation, planning and management as they identify specific soil types on the landscape. Field mapping for the initial inventory was completed in 2002.

Special Area Land Treatment (SALT) Program: Participants in specially designated watersheds use a combination of cost-share, loan interest-share and project grants to address soil and water conservation problems specific to that identified area and to carry out total resource management on their farms. The SALT program has already begun to expand to control pollution caused by sedimentation and chemical runoff from agricultural land.

Water Protection Program

The Water Protection Program (WPP) derives its authority from the Missouri Clean Water Law, Sections 644.006 through 644.141 RSMo, and provides staff support to the Clean Water Commission (CWC). Administrative rules promulgated under the Clean Water Law may be found in 10 CSR 20. Section 644.021 (1) RSMo designates the CWC and the water pollution control agency for the state, and 644.136 further designates the CWC as the water pollution agency for purposes of administering federal water pollution control acts.

The Clean Water Law, 644.051 RSMo specifically lists prohibited acts.

1. Causing pollution of any waters of the state. Placing, causing or permitting any water contaminant to be placed where it is reasonably certain to cause pollution of any waters of the state;
2. Discharging any water contaminants into any waters of the state that reduce the quality of such waters below water quality standards.

DNR has the authority to conduct investigations concerning violations of the Clean Water Law. Section 644.056 RSMo requires the department to cause investigations to be made upon request of the commission or upon receipt of information concerning alleged violations of the Clean Water Law, any standards, limitations, orders, rules or regulations promulgated pursuant to the law. Investigations may be conducted as deemed advisable by the department. DNR has the authority to attempt to eliminate violations through conference, conciliation or persuasion. Failing this or in order to immediately halt endangerment to the health or welfare of persons, DNR may order abatement or file an abatement complaint with the commission.

Section 644.076 RSMo allows the CWC or DNR to institute a civil action for injunctive relief to prevent violation and allows for the assessment of penalties. The attorney general or local prosecuting attorney may take action. This section also sets penalties for falsifying any documentation required by the Clean Water Law and for willful or negligent violation of the law.

In addition to the above penalties, Section 644.096 RSMo allows DNR to collect actual damage costs. These may include all costs and expenses necessary to establish and collect such costs, and the costs and expenses of restoring any waters of the State to their condition prior to the violation.

Animal waste permits and LOAs: DNR has regulatory authority over Animal Feeding Operations (AFOs), 10 CSR 20-6.300. Letters of Approval (LOAs) and construction or operating permits can be obtained for AFOs from the department based upon the total animal units proposed at a facility. Class II and smaller facilities are allowed to obtain a LOA on a voluntary basis (Class II = 300-999 animal units). Class IC (1,000-2,999 animal units), IB (3,000-6,999 animal units), and IA (>7,000 animal units) facilities are all required to obtain construction permits, 10 CSR 20-6.300. All construction permit applications require a fee of \$500. Operating approvals and permits require a professional engineer's certification of structures by presenting a signature and seal on the application form. General operating permits are available for Class IC and IB facilities for \$150 for up to five years. Site-specific operating permits for Class IA facilities are \$3,500 per year.

Under 10 CSR 20.010-030 operators of Class IA Concentrated Animal Feeding Operations (CAFOs) are required to be certified by the department. The rule defines certification requirements, personnel who must be certified, level of certification required, and sets fees for certification and renewals.

State Revolving Fund: Section 644.122 RSMo allows the state to provide low interest loans to public entities for planning, design and construction of water and wastewater treatment facilities. The program is a cooperative effort of the US Environmental Protection Agency (EPA), WPCP, the Clean Water Commission and the Environmental Improvement and Energy Resources Authority. The loans provide financing at below market rates for 100 percent of the eligible cost of wastewater treatment and conveyance systems. At present, interest is approximately one third of the market rate of municipal bonds. Loans are made for up to 20 years.

Animal Waste Treatment System Loan Program: The Animal Waste Treatment Loan Program is a cooperative venture of the Missouri Departments of Agriculture and Natural Resources, WPCP, EPA, CWC and Missouri Agricultural and Small Business Development Authority (MASBDA), which administers the program. It is authorized in 644.122 RSMo, and funded through the Missouri State Revolving Fund from the sale of water pollution control bonds and federal capitalization grants. MASBDA's administrative authority is found in 348.220 RSMo.

The program is designed to finance animal waste treatment systems for independent livestock and poultry producers at interest rates below market levels. Loans may be used to finance waste management structures and equipment approved as part of a DNR LOA for an animal waste management system. Borrowers must not exceed the 1,000 animal unit limit. Loans can finance up to 100 percent of system cost, minus any federal or state cost-share assistance, and may be made for up to ten years.

Storm Water Permits: Under state regulations passed in August 1992, a Missouri State Operating Permit is required for storm water runoff from certain industrial sites, construction sites, and urban storm sewers (10 CSR 20-6.200). Most of these facilities are issued a general permit, which is written to cover a broad category of pollutant sources. General permits may use a combination of management practices, monitoring, and effluent limits to manage the pollutants.

Site-specific permits for storm water discharges are written when a general permit is not available for the activity; when the facility is a significant contributor of pollutants based upon such factors as proximity to sensitive waters, size of discharge, or nature of pollutants; or when the facility is not in compliance with its general permit. Site-specific permits will include a combination of management practices, monitoring requirements, and effluent limits based upon best available technology and water quality goals.

Secondary Containment: The department requires by rule, 10 CSR 20-8.500, that facilities which store, mix, apply, or repackage bulk agrichemicals (fertilizers and pesticides) for more than thirty consecutive days in a year, must have appropriately designed secondary containment facilities to prevent a release of chemicals into waters of the state. These secondary containment facilities must obtain a construction permit from the department before construction and subsequently an operating permit. Secondary containment facilities consist of protective walls or dikes around bulk storage tanks to contain spills, concrete pads under loading areas to facilitate the collection of spilled product and residue from cleaning of equipment, and provisions for proper management of rinsates generated during application equipment cleaning and use.

Nonpoint Source Pollution Management Program: This program is authorized and funded under Section 319 of the Clean Water Act. The NPS Management Program is an integrated approach that develops and coordinates nonpoint source activities with federal, state, local and private sector entities in information, education, demonstration, technical assistance, and implementation assistance.

Public Drinking Water Program

Authority for the Public Drinking Water Program (PDWP) is derived from the Missouri Safe Drinking Water Act, Section 640.100 through 640.140 RSMo with rules in 10 CSR 60. The program supervises the design, construction and maintenance of public water systems (PWS). Perhaps the most important function of the program, from a NPS perspective, is the requirement for monitoring for water contamination, publication of the monitoring results and establishment of maximum contaminant levels allowed in drinking water.

Drinking Water Monitoring Data: Section 640.120 RSMo requires monitoring for contaminants 1) as listed in state drinking water regulations, 2) included in the national primary drinking water regulations, 3) required under the federal Safe Drinking Water Act or 4) which DNR finds may be hazardous to public health. Specific contaminants and their maximum contaminant levels (MCLs) are found in 10 CSR 60-4.020 through

4.110. General classifications of contaminants are microbiological contaminants; inorganic chemicals; synthetic organic chemicals, which includes some pesticides; trihalomethanes; unregulated chemicals; and special volatile organic chemicals. Section 640.130 RSMo allows DNR to issue notification and abatement orders when it has been determined that an emergency condition exists which endangers or could be expected to endanger public health. Ambient water quality in drinking water supply reservoirs is not directly monitored. Drinking water is tested after treatment. However, the data is a useful tool and will show water quality standards violations in many instances.

In instances where PWSs are not in compliance with the MCL for particular contaminants, DNR, under 10 CSR 60-6.020 (1) of the Missouri Public Drinking Water Regulations, may after public hearing, grant an exemption from a MCL requirement. The department is required to provide to the PWS a schedule of compliance for each MCL requirement covered by the exemption. The compliance schedule contains conditions the department may prescribe and steps and timetable to move back into compliance. When the contaminant(s) is/are the result of agricultural activities, exemption conditions include a requirement to “work with Natural Resources Conservation Service, University Extension, Department of Agriculture, area farmers, and others in evaluating and implementing watershed protection measures and best management practices...” Watershed protection is a high priority for public water supplies and receives even more emphasis under the new Safe Drinking Water Act of 1996.

Source Water Protection Program: The Safe Drinking Water Act of 1996 (SDWA) requires states interested in flexible monitoring opportunities to delineate and assess drinking water source water areas throughout the state. States may also set up a Source Water Protection Program (SWPP). The steps involved in developing a SWPP include: 1) Inventory and characterize public drinking water sources; 2) Identify pollutant sources and relative impact; 3) Assess vulnerability of intake to contaminants; 4) Establish source water protection goals; 5) Implement the program; and 6) Monitor and evaluate program effectiveness. Through this program the PWS or any local government entity can petition the PDWP for approval to set up a local, voluntary partnership with any affected persons and organizations to protect the drinking water supply from contamination. EPA approval for Missouri’s Source Water Protection Program is pending.

The NPS program and the SWPP can complement one another very effectively. For example, section 319 funding may be used for some assessment activities. In addition, the assessments developed for the NPS program can provide information and data about pollution sources which may contribute to contamination of public drinking water supplies and identify surface waters known or suspected of being contaminated by nonpoint source pollution. Conversely, the SWPP can provide information and data from source water assessments that could help expand coverage of state water quality assessments. Source water assessments may provide additional data upon which to base 303(d) listing decisions and also to develop TMDLs for a particular water body. Nonpoint source staff involved with TMDL studies are working closely with staff in the PDWP to share assessment data in an effort to reduce duplication.

The SDWA provides funding for a drinking water state revolving fund for low interest loans to public water systems for capital improvements (planning, design and construction of water plants, tanks, water lines, etc.). After the source water protection programs established by the SDWA are implemented, there may also be opportunities for loans from this fund to be used for source water protection activities.

Vulnerability Assessments: Federal regulations (40 CFR 141-143) require public water systems to perform baseline monitoring for all the chemical contaminants listed in the regulations. Some of the most common synthetic organic contaminants (SOCs) for which testing is required are pesticides; analyses are very expensive. If it can be determined that a selected chemical is not used, stored, disposed, manufactured or transported within one half mile of a public well or within a drinking water impoundment's watershed, then a monitoring waiver may be granted to that system for the specific chemical, thus reducing that monitoring requirement.

Missouri has issued waivers by performing vulnerability assessments on every public water supply system. A geographic information system (GIS) is used to record the location of all public wells and surface water intakes. Characteristics of the wells or watershed are recorded, as are sources of SOCs. A routine search of over 100 databases is executed every quarter to locate new sites where SOCs have been used, stored, transported, or disposed. The GIS can analyze which water supplies are vulnerable based on proximity of contaminant sources. Secondary considerations utilized to determine susceptibility include well construction, geology, overlying soil types, direction of groundwater flow, characteristics of contaminants and others. If a source of contamination is located within one-half mile of a well (450 wells out of 2000 total have been identified as vulnerable) or within the watershed of a surface water supply, that water source is considered vulnerable, and testing is required.

Air and Land Reclamation Division

The Land Reclamation Program (LRP) derives its authority from the Land Reclamation Commission, Sections 444.350 through 444.970 RSMo, and provides staff support to the Land Reclamation Commission. The U.S. Congress enacted Public Law 95-87, the Surface Mining Control and Reclamation Act of 1977, which regulates surface coal mining operations. It established a program and funding for reclaiming abandoned coal mine lands that were disturbed prior to August 3, 1977. The Land Reclamation Program obtained primacy to carry out the provisions of Public Law 95-87 from the Office of Surface Mining in 1981. The Land Reclamation Program also regulates industrial minerals and metallic minerals.

Surface Coal Mining: The Land Reclamation Program is responsible for regulating active coal mining activities within the state as outlined in Sections 444.800 through 444.970. Primary goals are to assure that surface coal mining is conducted in a manner to minimize or prevent adverse effects to the citizens of the state and the environment. The program is responsible for assuring that sedimentation and discharges from mining sites comply with NPDES requirements.

Industrial Minerals Mining: The Land Reclamation Program is responsible for regulating activities associated with the mining of clay, limestone, sand, gravel, barite and tar sands as outlined in Sections 444.500 through 444.789. Primary goals are to assure that the mining of these commodities is conducted in a manner to minimize or prevent adverse effects to the citizens of the state and the environment.

Metallic Minerals Mining: The Land Reclamation Program is responsible for regulating activities from the handling and disposal of waste associated with the mining, beneficiation, and primary smelting of minerals or mineral ores containing lead, iron, zinc, silver and gold as outlined in Sections 444.350 through 444.380 RSMo. The primary goal is to assure that metallic mineral wastes are disposed of properly to minimize or prevent adverse effects to the citizens of the state and the environment. All operations associated with the mining of metallic minerals are required to obtain an NPDES permit.

Abandoned Mine Lands: The Land Reclamation Program is responsible for reclaiming mined lands presenting health and safety problems associated with coal mining that occurred prior to August 3, 1977, as outlined in Sections 444.810 through 444.940. Priority for reclamation of past coal-mined lands is based on classification of 1) the protection of public health and safety from extreme danger (e.g., high walls and open shafts), and 2) the protection of public health and safety not constituting extreme danger, and 3) restoration of land and water previously degraded.

Reclamation is funded by a federal tax on coal. The U.S. Office of Surface Mining Reclamation and Enforcement collects from producing coal companies 35 cents a ton on surface mined coal and 15 cents a ton for coal mined underground. Money is deposited into the Abandoned Mine Land Reclamation Fund and dispersed through grants to states. Declining coal production has resulted in decreased allocations; therefore, Congress has included a minimum base funding amount for states with limited coal production to continue their reclamation programs. Language is included in the federal appropriation which allows AML funds made available to states to be used as non-federal match for programs related to the treatment or abatement of acid mine drainage.

Most abandoned mine lands in Missouri do not require reclamation and provide wildlife habitat and recreational opportunities. DNR offers technical assistance to owners of abandoned coal mine lands. Staff personnel can provide expertise in soils, revegetation and water quality. Such assistance includes literature, workshops and onsite visits with landowners to discuss their problems and improve revegetation and water quality on their property.

Environmental Assistance Office

DNR established the Environmental Assistance Office to provide services that can be described as information, education, training and assistance. The program serves owners and employees of businesses, agricultural operations, elected officials, local governments, teachers and the general public. Its primary function is to help people understand and comply with environmental statutes and regulations.

Pollution Prevention: This unit works to protect the environment by encouraging pollution prevention. Sometimes referred to as waste minimization or waste reduction, it is the use of materials, processes and practices that reduce or eliminate the creation of pollutants at the source. The unit provides pollution prevention information and assistance, training and presentations, informational materials and coordination with other DNR staff.

Environmental Education: The Environmental Education Unit's objective is to promote environmental literacy of Missourians by providing knowledge to effectively solve existing environmental problems, prevent new ones, and maintain a sustainable environment. Unit focus is upon in-service training for teachers, providing graduate-level college courses on environmental issues. Unit staff coordinate the production and collection of educational materials within the Division of Environmental Quality and distribute these materials.

Operator Certification and Training: This unit has two primary duties: certification of and providing training for water supply and wastewater operators. The unit has developed a statewide training plan for operators identifying what training is provided, and where it can be obtained, areas of training which are insufficient, and how those needs can be addressed. The unit publishes a bimonthly newsletter for certified operators, "Water and Wastewater Digest," to provide updates on training courses, changes in regulations, etc.

Business Assistance: The unit provides guidance to businesses to help them understand and comply with environmental regulations, obtain permits, access governmental information sources, and incorporate pollution prevention concepts into their operations. Unit staff provide technical assistance to businesses with emissions inventories as required in the Clean Air Act Amendments of 1990. It also maintains the Toxics Release Inventory database.

Local Government Assistance: Guidance is provided to communities with operator assistance and facilities troubleshooting, voluntary assessment of wastewater systems, individualized in-depth community assistance with cross-media environmental issues and project financing.

Agricultural Assistance: Staff assist farm operators and agribusiness in understanding and complying with environmental regulations and applying pollution prevention concepts, and conducts outreach efforts such as displays, presentations and workshops.

Information Service: EAO's information service staff provide Missouri citizens a direct link with DNR through a toll-free number. Individuals can promptly access professionals who can respond to environmental questions, complaints or concerns. EAO can provide many division publications and materials upon request.

GEOLOGICAL SURVEY AND RESOURCE ASSESSMENT DIVISION

Within DNR is the Geological Survey and Resource Assessment Division (GSRAD) which, through the Oil and Gas Council, has regulatory authority over potential use and development of Missouri's oil and gas resources (including exploration drill hole construction, abandonment and plugging), dams, and water resources. In accordance with 256.110 RSMo, the state geologist (division director) is authorized to cooperate with federal and state agencies and to enter into formal cooperative agreements. Section 256.050 RSMo gives GSRAD the responsibility for determining positions, formations, arrangements, composition and utilization of both surface and ground water. This section also requires the publication of appropriate reports of work completed and educational bulletins on geology, water and well construction.

Water Resources Program (WRP)

The State Water Plan, authorized under the Missouri Water Resources Law (640.400 through 640.435 RSMo) must prepare and periodically update a state water plan that assesses the state water resources. Technical publications on drought response planning, flood analyses, information directories and future public interaction help with informing the public and assisting future policy makers with the information they need to make the best decisions for the prudent use and protection of water resources. A seven volume technical water resource characterization study and six regional reports of functional water use problems and opportunities are being produced. Use of an interagency task force is mandated to provide direction for the plan. The task force is made up of the Missouri Departments of Agriculture, Conservation and Health; the University of Missouri College of Agriculture, Food, and Natural Resources; and other agencies and departments as appropriate.

Water Resources maintains records submitted by public water well drillers. The primary information about a well is contained in a driller's log, which is defined in Section 256.603(4). The log contains information such as depth, volume, and geologic strata encountered. When information from drillers' logs are linked together, a picture of geological conditions and ground water are obtained. This allows experts to predict where water supplies can be impacted by surface activities and assists in siting potential impact sources such as CAFOs in order to protect groundwater, springs and water supplies.

The Major Water Use Registration data files maintained in the program contain on a statewide basis the spatial location, intended use, quantity withdrawn, and source of water for those users who have the daily capacity to pump 100,000 gallons or more.

The WRP also provides technical assistance with stream erosion, deposition, surface water flooding, drought impacts, location and health of wetland resources, contributing areas for springs and wells, groundwater level monitoring and additional studies that are used to determine water movement and predictions of ground and surface water flow. Image processing and digital data analyses are used to determine contributing watersheds, streams, groundwater aquifers, wetlands and lakes for mapping. Data layers are analyzed

using ARC-INFO, ARC-View and PCI Satellite Imaging. These projects can show, and in the future will assist in, analyzing nonpoint source impacts upon the land, water and groundwater sources.

Under Section 640.418(1) RSMo special water quality protection areas may be established. Designation of these areas is related to exceedence of maximum contaminant levels (MCLs) in a public water system. DNR must consider the probable effects of the contamination on human health and the environment, duration of contamination, quality, quantity and use of the water, and effectiveness of protective measures.

Geological Survey Program

The Program has developed an Aquifer Classification System. The system regionalizes aquifers into areas according to their susceptibility to contamination. Areas were defined using hydrologic and geologic parameters of shallow bedrock or surficial deposits, aquifer recharge potential, presence or absence of an aquiclude, and the natural or current ground water quality. Losing stream demarcations determine where a surface to groundwater exchange is likely to occur. Designations are intended to protect groundwater.

One of the more important areas regulated by DGLS is that of water well drillers. Section 256.600 through 256.640 RSMo is titled the Water Well Driller's Act. Subsequent regulations are found in 10 CSR 23. Those who drill wells for water use, monitoring, or exploration holes wells are required to obtain a permit from DGLS. Regulations specify construction and plugging standards for well drillers and landowners. Considerations include drainage patterns, elevation, sanitation and pollution prevention. Also specified are distances from pollution or contamination sources such as chemical and fertilizer storage areas, manure storage areas and septic tanks. The Act also requires that water (dye) tracing must be registered and traces reported.

As a part of overall protection of ground water, 10 CSR 23-3.020 discusses maintenance and repair of wells and abandonment of wells. It delineates steps to be taken when a well is to be abandoned. Abandoned wells attached to a structure or on site must be plugged prior to connection with a public water supply in order to prevent cross contamination.

10 CSR 23-3.030 and 10 CSR 23-3.070 contain standards for well construction. These include specifications for well casings, minimum depths, grouting, etc. In addition, specific, regionalized standards are mapped in 10 CSR 23-3.090.

Missouri Department of Agriculture

Bureau of Pesticide Control

Pesticides: The Missouri Department of Agriculture (MDA) is the state lead agency for pesticide regulation and control. Generally, that responsibility may be divided into three areas: enforcement of laws relating to the use and misuse of pesticides; the certification and licensure of pesticide applicators and dealers; and the registration of pesticides in

Missouri. MDA has primacy for pesticide enforcement and the ability to certify pesticide applicators under authority of the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA).

All pesticides sold in Missouri must be registered with MDA. Conditions for registration are found in the Missouri Pesticide Registration Act, 281.210-310 RSMo. MDA will pursue additional legal authority as deemed necessary to protect Missouri water resources from pesticide contamination.

Section 281.070 RSMo grants MDA the authority to investigate the use of pesticides. Investigations are conducted in response to complaints or when violations of the statutes or rules are identified during inspections. As defined in 281.020 RSMo, “use” is mixing, applying, storing or disposing of a pesticide. Misuse is “a use of any registered pesticide in a manner inconsistent with its labeling...”. When violations are identified, civil and/or criminal penalties (281.060 and 281.1-5 RSMo respectively) may be issued against responsible individuals.

MDA conducts inspections of pesticide manufacturers to assure that pesticides are properly registered, labeled and packaged. Formulation verification samples are collected and records are monitored in accordance with EPA criteria. Inspections of retail outlets are made to ensure that only pesticide products properly registered for use in Missouri are being offered for sale.

Section 281.025 RSMo gives MDA the authority to issue regulations. These regulations may prescribe application methods and the amounts and concentrations of pesticides used. Also, they may restrict or prohibit pesticide use in certain areas during specified periods of time when deemed necessary to prevent damage or injury. A pesticide’s use may be restricted if unreasonable adverse effects to the environment or public health result from its use. In determining the need for regulations, consideration will be given to pertinent research findings, and recommendations of other Missouri agencies, the federal government, and other reliable sources.

MDA certifies pesticide applicators and licenses pesticide dealers who sell restricted-use pesticides to the end user. Through University Extension MDA offers training to pesticide applicators and certifies all noncommercial applicators, private applicators and public operators who use restricted-use pesticides and all commercial applicators using pesticides. Licenses are required for pesticide technicians working in ornamental and turf, general structural and termite pest control categories. The purpose is to educate and set a level of competency so applicators and technicians are familiar with the human and environmental hazards associated with pesticide use.

The pesticide applicator certification program is managed by the MDA under statutory authority provided by the Missouri Pesticide Registration Act 281.210-282.310, RSMo (Cum. Spp. 1993), and the Missouri Pesticide Use Act 281.005-281.115 RSMo (1994). Its provisions attempt to ensure that pesticide use be both limited and controlled as follows: limit use to (1) appropriate concentrations, (2) approved uses, and (3) application

by trained persons. Generally, these specifications are itemized on the pesticide label. The Cooperative Extension Service provides training with participation from DNR.

Missouri Department of Conservation

The Missouri Department of Conservation (MDC) has designated authority to manage the fish, forestry, and wildlife resources of the state. The department's principal sources of revenue are receipts from the sale of hunting and fishing permits and the one-eighth of one percent conservation sales tax. Funds are also received through Federal legislation from user taxes on sales of hunting and fishing equipment apportioned based on state hunting and fishing license sales. Other funding is received under provisions of the Endangered Species Act and from one-time grants and contracts.

MDC makes available funding for three cost-share programs administered by the DNR's Soil and Water Conservation Program.

- ◆ The Wetland Heritage Program is funded jointly by MDC and the US Fish and Wildlife Service. Program objectives are providing fish and wildlife habitat, restoring native wetland vegetation, and developing and protecting riparian zones when wetlands are restored or created adjacent to rivers and streams.
- ◆ An additional 25 percent cost-share is available to landowners for seeding Conservation Reserve Program acres. The addition is designed to encourage more producers to enter land into the program and encourage planting those mixtures that have greater wildlife benefits.
- ◆ An additional 25 percent cost-share is available to landowners for wetland restoration on Wetland Reserve Program easement acres up to \$50 per acre.

Agricultural Liaison: The agricultural liaison program is designed to counter declining wildlife habitat conditions on private land and involves working with state, federal and private entities which deal with agriculture. The program encourages awareness of the effect of farm practices on natural resources and development of farming systems beneficial to fish, forests and wildlife.

Fisheries Division

The Fisheries Division is responsible for the long-term survival of native aquatic plants, animals and habitats.

Stream Incentive Program: The Stream Incentive Program has three facets: The stream/watershed restoration project addresses stream-related watershed problems by encouraging willing landowners to protect and use their streams wisely. It provides cost-share incentives to help landowners keep livestock out of streams and ponds, control stream-bank erosion and improve fish and wildlife habitat.

Alternative Watering Sources for Planned Grazing Systems provides cost-share assistance to help landowners install alternative watering systems for livestock instead of using streams for watering. Eligible systems include mechanical and solar watering devices that provide water to livestock away from streams.

Stream Stewardship Agreements are for landowners that already have shown their dedication to long-term protection of healthy stream corridors. Landowners submit written bids for per-acre payments, and the MDC pays landowners cash over a ten-year period if they protect and manage stream-side property under a stream management plan and assure continued protection through a conservation easement. Stream Stewardship agreements are available only on priority streams. Fisheries district supervisors rank each stream based on resources in their areas. These may include smallmouth bass, endangered species, trout or recreational uses.

Streams for the Future: The Stream Incentive Program's roots extend back to the Streams for the Future initiative. Goals were to involve Missouri citizens in stream stewardship, improve fish and wildlife habitat along streams and help landowners use conservation-wise practices to protect stream resources.

Among programs developed to meet those goals was the Missouri Stream Team, an adopt-a-stream program sponsored by the Missouri Conservation Federation, MDC and DNR. Stream Teams pick up litter, plant trees, install fish habitat structures, bring information about stream conservation into classrooms, or take training to monitor stream water quality. The Volunteer Water Quality Monitoring Program is an extension of the Stream Team program offered to interested teams and team members. It provides various levels of training to allow citizens to monitor the physical, chemical, and biological aspects of streams.

MDC also provides technical advice and material assistance for stream-improvement projects. It maintains demonstration areas where landowners can see stream conservation in practice and can provide brochures that explain how to deal with common stream problems. Management biologists provide management advice and technical assistance to private landowners with lake or stream problems, stream erosion and habitat concerns, and provide technical assistance to state and federal agencies, local governments and public utilities.

Forestry Division

The Forestry Division is responsible for management and protection of the state's forest resources. Major objectives are rural fire protection, promotion of sustainable forests, research to improve forest management and biodiversity, sustainable management and protection of public lands, and cooperation with public and private agencies in disease and insect control.

Agroforestry Program: The Missouri Economic Diversification and Afforestation Act of 1990 (as amended, 1993) established the Agroforestry Program. It directed MDC to develop and implement the program in cooperation with several other organizations.

Agroforestry is the practice of planting or establishing rows of trees or shrubs bordered on each side by a narrow strip of ground cover, alternated with wider strips of row crops, grass or other crops. The intent is to provide state rental payments on Conservation Reserve Program (CRP) lands for an additional ten-year period after the federal contract expires, if those lands are used for agroforestry purposes. The program also allows participation on lands not enrolled in CRP. Due to budget constraints, no new sign-ups are being accepted for this program.

The program provides annual incentive payments that can be combined with other income from the land to produce income substantially equal to the previous CRP payment. Financial assistance to share the cost (up to 75 percent) is provided to establish trees and/or shrubs to be used in the program.

Agroforestry allows cropping systems using trees and row crops, forage crops, alternative crops and horticulture crops. Benefits include reduced erosion, buffer/filter strips, riparian protection, increased biodiversity, nutrient retrieval and opportunities for use of small acreages and niche markets.

Technical Assistance: Through a cooperative program with the US Forest Service, technical assistance is provided to private woodland owners. Service includes tree selection, planting advice, forest management recommendations, forest product utilization and market assistance, and wildlife management recommendations. Tree planting plans are prepared for qualifying communities to assist with plantings on public lands. Assistance is provided to forest product manufacturers and forest landowners on resource availability, market information, new technologies, manufacturing efficiency and training. Individual businesses are encouraged to improve utilization and reduce output of residues through environmentally acceptable manufacturing methods.

Forest Cropland: Under terms of the State Forestry Act, passed by the General Assembly in 1946, land classified as forest cropland is eligible for a partial tax deferment. A number of conditions apply, and the owner must agree to follow basic forest management requirements designed to keep the land in permanent forest production.

Wildlife Division

The Wildlife Division is responsible for programs related to wildlife resources of the state including management of 363 conservation areas. Field staff provide a range of technical assistance to private landowners and annually develop 400-500 management plans for new cooperators. The division operates two demonstration farms, trains Natural Resources Conservation Staff in wildlife management principles and has staff wildlife biologists assigned to all Missouri NRCS offices. Wildlife restorations are conducted with species such as ring-necked pheasants, prairie chickens, osprey and assisting other states in wild turkey restoration.

The division conducts research in all phases of wildlife management with an emphasis on long-term ecosystem studies. Approximately five cooperative studies on agricultural topics affecting wildlife are underway annually.

Outreach and Education Division

The Outreach and Education Division informs the public about Missouri's forest, fish and wildlife, and works to involve people in conservation activities and outdoor recreation. It uses a wide range of mass communications tools including a 400,000+ circulation monthly magazine, weekly news packet, TV and radio programs, Internet website, and a variety of audio, video, book and print publications.

Schools and young people receive special attention through grade-targeted curriculum materials, visual aids, lesson plans, and teacher workshops. These are coordinated through a team of field-based consultants who regularly visit schools and work closely with teachers and administrators.

Face-to-face service to the general public is provided through the division's four nature centers, metropolitan offices, ombudsman's office, exhibits and others. These units provide both programs and personal contact, answering questions and providing general background material on conservation.

Missouri Department of Health and Senior Services

The Missouri Department of Health and Senior Services (MDHSS) directs and manages public health functions and programs in the state, (192.005 RSMo). In accordance with Section 192.001 RSMo, the department is required to monitor adverse health effects of the environment and prepare population risk assessments regarding environmental hazards. These assessments may relate to water, toxics, and others.

Section for Environmental Public Health

The section provides consultation, technical assistance, and inspection services related to food protection, private water supplies, lodging establishments, risk assessments, and environmental investigations and follow-up of communicable disease outbreaks. Licensed private inspectors are now conducting evaluations of existing private water wells and on-site sewage treatment systems for individual homes when requested by lending institutions, realtors, property owners or potential buyers, as allowed in section 701.051 RSMo.

MDHSS maintains statutory authority over on-site disposal systems under Sections 701.025 through 701.059 RSMo and implemented by 10 CSR 20-3.060, Minimum Construction Standards for On-Site Sewage Disposal Systems; 19 CSR 20-3.070, Fees Charged by Department of Health for Inspection of Existing On-Site Sewage Disposal System Requested by a Lending Institution; and 19 CSR 20.3080, Description of Persons Qualified to Perform Percolation Tests or Soils Morphology Examinations in Determining Soil Properties for On-site Sewage Disposal Systems. Domestic, no-discharge sewage treatment facilities that have a designed maximum daily flow or an actual maximum daily flow of three thousand gallons or less fall under these sections. Single family residence with lots of three acres or more are exempted.

Section 701.038 RSMo limits complaint investigation to instances of communicable disease investigation and complaints by an aggrieved party or adjacent landowner. Section 701.040 requires MDHSS to develop a state standard for location, size of sewage tanks, length of lateral lines based on percolation rates or soil properties, construction, installation and operation of on-site sewage disposal systems. The statute goes on to set requirements for inspections, permits, system modification or major repairs and contractor registration, and directs fees be collected.

Persons installing or repairing an on-site sewage system should first contact the County Health Department. Information must be provided on an application indicating the soil and site conditions, systems design, and setback distances. All factors must be acceptable to minimum construction standards before a permit will be issued. Law provides penalties for installation of systems without required permits.

US Department of Agriculture

Natural Resources Conservation Service and Farm Service Agency

The Natural Resources Conservation Service (NRCS) and the Farm Service Agency (FSA) in the U.S. Department of Agriculture have traditionally provided technical and financial assistance to landowners, producers and others needing to apply conservation practices. NRCS, formerly the Soil Conservation Service, has provided guidance for over sixty years in soil and water conservation. FSA, formerly the Agricultural Stabilization and Conservation Service, determined practices which would be cost-shareable, set cost share rates, and issued checks.

The conservation provisions of the 1996 farm bill simplified existing conservation programs and improved their flexibility and efficiency. The bill also created new programs to address high priority environmental protection goals. While the NRCS and the FSA retained the essence of their traditional roles of technical assistance and financial assistance respectively, the 1996 farm bill redefined and blended their responsibilities and authorities in targeting assistance and setting eligible cost shareable practices and rates.

The 1996 farm bill reformed an existing program, the Environmental Conservation Acreage Reserve Program (ECARP) which encompassed the existing Conservation Reserve Program, the new Environmental Quality Incentives Program (EQIP) and the Wetland Reserve Program (WRP). It phased in EQIP while ending the Agricultural Conservation Program, Colorado River Basin Salinity Control Program, Water Quality Incentives Program and the Great Plains Conservation Program.

Conservation Reserve Program: The Conservation Reserve Program (CRP) protects highly erodible and environmentally sensitive lands with grass, trees and other long-term cover. It allows up to 36.4 million acres to be enrolled nationally at any one time. New enrollments can replace expired or terminated contracts. It allows owners or operators who entered into a contract before 1995 to terminate contracts on certain acres after

giving written notice. Those contracts must have been in effect for at least five years. Lands with high environmental values are not eligible for early release.

Conservation Reserve Enhancement Program (CREP): The Conservation Reserve Enhancement Program is a new initiative established as part of the highly successful Conservation Reserve Program. CREP expands CRP's effectiveness by allowing USDA to work in partnership with States and local interests to meet specific conservation objectives. CREP is a community-based program, centered around local participation and leadership, with financial incentives and technical assistance provided by USDA. It is results-oriented, requiring clear program goals and annual monitoring to measure progress and ensure success. Like CRP, CREP contracts require a 10 to 15-year commitment to keeping lands out of agricultural production, ensuring lasting benefits.

Environmental Quality Incentives Program (EQIP): The Environmental Quality Incentives Program is a new program, which combines the functions of the Agricultural Conservation Program Water Quality Incentives Program, Great Plains Conservation Program and the Colorado River Basin Salinity Control Program. It was funded nationally at \$130 million in fiscal year 1996, \$200 million in 1997 and 1998 and \$175 million in 1999. Livestock-related conservation practices will receive 50 percent of program funding on a national basis.

Conservation priority areas are established locally where significant water, soil and related natural resource problems exist, in cooperation with state and federal agencies and with the state technical committees. Higher priority for funding is given to areas where state or local governments offer financial or technical assistance, or where agricultural improvements will help meet water quality objectives. EQIP establishes five-to ten-year contracts to provide technical assistance and pay up to 75 percent of the costs of conservation practices focusing on manure management, pest management and cropland erosion control.

The bill defines land eligible for EQIP contracts as agricultural land that poses a serious problem to soil, water or related resources. It does not allow large livestock operations to be eligible for cost-share assistance for animal waste management facilities, but they do remain eligible for technical assistance. Activities must be carried out under the contract according to a conservation plan. Total cost-share and incentive payments are limited to \$10,000 annually per person and to \$50,000 for the life of the contract.

Wetland Reserve Program: The Wetland Reserve Program (WRP) incorporates changes designed to provide more flexibility to farmers and sets an enrollment cap of 975,000 acres nationally. The revisions require one-third of total program acres be enrolled in permanent easements, one-third in 30-year easements, and one-third in restoration only cost-share agreements. Individuals may choose the category for their eligible land. Landowners are provided up to 100 percent cost-sharing for permanent easements, 75 percent for 30-year easements and 75 percent for restoration cost-share agreements.

Conservation Research and Education: The National Natural Resources Conservation Foundation has been created as a charitable nonprofit corporation to fund research and educational activities relating to conservation on private lands. The foundation promotes innovative solutions to conservation problems through public-private partnerships. It also accepts private gifts of money or property to be used for conservation activities. Congress authorized \$1 million annually from 1997 through 1999. The new foundation offers grants for research, education and demonstration projects. Grants will also assist conservation districts in building resources to carry out local conservation programs.

Conservation of Private Grazing Land: The grazing lands provision ensures technical, educational and related assistance is provided to landowners on the nation's 642 million acres of private grazing lands.

Flood Risk Reduction: Voluntary contracts are authorized that provide one lump sum payment to producers who farm land with high flood potential. The payment will equal 95 percent of the seven-year marked transition payments and other payments to offset estimated federal outlays on frequently flooded land. In return the producer agrees to comply with applicable wetlands and highly erodible land requirements and to forego commodity loans, crop insurance, conservation program payments and disaster payments.

Wildlife Habitat Incentives Program: This provision helps landowners improve wildlife habitat on private lands. It provides cost-sharing to landowners for developing habitat for upland wildlife, wetland wildlife, endangered species, fisheries and other wildlife. The state technical committee is to be consulted for setting priorities for cost-share measures and habitat development projects.

Emergency Watershed Protection Program Floodplain Easements: The Secretary is authorized to purchase floodplain easements under the Emergency Watershed Protection Program.

Watershed Protection and Flood Prevention Act (PL-566)

PL-566 authorizes the U.S. Secretary of Agriculture to cooperate with state and local agencies in planning and carrying out improvements for soil conservation and other purposes. It provides for technical, financial, and credit assistance, by USDA, to local organizations representing the people living in small watersheds. It also provides for needed additional treatment and protection of federally owned lands within these watersheds.

The Watershed Protection and Flood Prevention Act works through local government sponsors and helps participants solve natural resource and related economic problems on a watershed basis. Projects include watershed protection, flood prevention, agricultural water management, erosion and sediment control, rural water supplies and water quality, fish and wildlife habitat enhancement, wetlands creation and restoration, and public recreation in watersheds of 250,000 or fewer acres.

Both technical and financial assistance are available through NRCS which provides allocations of funds for plan development and implementation of individual projects. A project application must be submitted by local sponsors and prioritized by the Missouri Soil and Water Conservation Districts Commission prior to NRCS planning assistance. Project sponsors can be local or state units of government and usually include soil and water conservation districts and local watershed subdistricts. Practices to improve water quality through watershed land treatment are eligible for financial assistance with PL-566 funds.

Resource Conservation and Development Program: Resource Conservation and Development (RC&D) is a program which helps people initiate, sponsor, plan and implement projects that will benefit their communities. NRCS administers the program and provides a coordinator to designated RC&D areas. Local councils define the goals and objective to meet local needs. Councils may seek technical assistance from federal, state and local governments, local soil and water conservation districts and private industry. They may also seek and accept donations, loans, grants, or cost-sharing arrangements to help fund projects that address land conservation, water management, community development or environmental enhancement.

Forestry Incentives Program: The Forestry Incentives Program was authorized by Congress in 1973 to share with private landowners the cost of tree planting, timber stand improvement and natural regeneration. Provisions were unchanged in the 1996 farm bill. The objective is to increase the nations supply of timber products with emphasis on continued sustained yield; cost-effective forest improvement practices; and enhancement of other forest resources. Federal annual cost share ranges up to 75 percent depending on county participation and cost share rates set for that county. Fencing is required, but not cost shared. A one-acre minimum wooded contract area is required.

Stewardship Incentive Program: The Stewardship Incentive Program is designed to encourage private landowners to actively manage their forest land and improve natural resources by providing cost-share assistance for the installation of environmentally oriented practices - plan development, reforestation and afforestation; forest improvement, agroforestry establishment; soil and water protection; riparian and wetland protection; fisheries habitat enhancement; wildlife habitat enhancement; forest recreation enhancement; and reforestation. A ten-acre minimum of wooded area is required except in agroforestry. The MDC has in recent years provided additional matching funds to keep the program intact.

Forest Service

The Forest Service is charged with promoting the sustainability of ecosystems and providing public service through conservation leadership. Providing benefits from the National Forest is a primary thrust of multiple use and sustained yield management. The signing of the Record of Decision for the final EIS in 1986 represents the first level of decision making related to land and resource management planning. This decision determined the desired future condition of the Mark Twain National forest and established the standard and guidelines under which future projects would be

implemented. This document was completed in accordance with the National Environmental Policy Act (NEPA) and the Council of Environmental Quality implementing regulations for NEPA. The Mark Twain Land and Management Resource Plan currently directs Forest management activities, including timber management, recreation, wilderness, fisheries, range, roads, minerals, fire, soils, water and air. Final level decisions focuses on the analysis and implementation of management practices and projects designed to achieve the goals and objectives of the Forest Plan, subject to FOIA and NEPA.

Specific language regarding Forest Service management is contained with the following 36 CFR Sections:

219.23 - forest planning shall provide compliance with requirements of the Clean Water Act and evaluation of existing or potential watershed conditions that will influence soil productivity, water yield, water pollution or hazardous conditions

219.27 – “conserve soil and water resources...”, “provide for adequate fish and wildlife habitat to maintain viable populations...”, and manage riparian areas to avoid detrimental water temperature and chemical composition changes, blockages of water course or deposits of sediment.

US Environmental Protection Agency

Agriculture Compliance Assistance Center: The US Environmental Protection Agency (EPA) with the support of the USDA has developed a national Agriculture Compliance Assistance Center (Ag Center) to provide a base for “one-stop shopping” for the agriculture community - one place for comprehensive information about approaches to compliance that are both environmentally protective and agriculturally sound. The Ag Center seeks to increase compliance by helping the agricultural community identify common sense ways to comply with environmental requirements.

The Ag Center will work with USDA and other federal and state agencies to provide information on topics such as pesticides; nonpoint source pollution; ground, surface and drinking water protection; animal waste management; agricultural worker protection and wetlands protection. It will also support regional and state regulatory agencies in their efforts to provide compliance assistance to local agriculture.

Office of Wetlands, Oceans and Watersheds

Nonpoint Source Control Programs: The Assessment and Watershed Protection Division serves as the national program manager for EPA’s nonpoint source control efforts. It also assists and guides nonpoint source programs that each state is required to develop under Section 319 of the Clean Water Act. Under Section 319 EPA has awarded more than \$420 million to States in 1990-1996. States use these grants to implement programs approved by EPA that include as appropriate, nonregulatory and regulatory programs for

enforcement, technical assistance, financial assistance, education, training, technology transfer, and demonstration projects.

Total Maximum Daily Load Process: A challenging task faced by water program administrators in addressing water pollution is determining the specific pollution control measures necessary to meet and maintain water quality goals and standards. Section 303(d) of the Clean Water Act describes ways to approach this task through the establishment of Total Maximum Daily Loads (TMDLs). The TMDL is the greatest amount of pollutants that a waterbody can receive without violating water quality standards.

The Assessment and Watershed Protection Division assists states in implementing programs that target watersheds for TMDL calculations. After a watershed has been identified for priority attention, and the TMDL has been established, individual waste load allocations (or limits) are designated for point and nonpoint sources (taking into account natural background levels, as well as a margin of safety). After implementing any additional pollution control measures that may be necessary to meet the TMDL, monitoring is conducted to assess the effectiveness of these control actions.

Wetlands Protection Measures: EPA's wetland protection regulatory responsibilities include reviewing proposed dredged or fill materials disposal activities under Clean Water Act Section 404 and Section 10 of the Rivers and Harbors Act and, if appropriate, restricting or prohibiting the use of discharge sites for these activities. EPA also develops regulations, policies and guidance to provide environmental criteria for discharges of dredged or fill material into wetlands regulated under Section 404. A technical testing manual is being developed to evaluate proposed discharges of dredged material in waters of the United States, including wetlands.

Watershed Protection: EPA has turned to naturally defined hydrological ecosystems-- watersheds-- as the primary focus for effort to protect and restore natural resources. A comprehensive approach is needed that takes into account threats to human and ecosystem health within specific watersheds. To some extent, this approach requires a departure from EPA's traditional focus on regulating specific pollutants and pollutant sources and an alignment of traditional regulatory and nonregulatory programs to support integrated natural resource management. Based on successes of comprehensive, aquatic ecosystem programs such as the Chesapeake Bay, EPA is promoting similar approaches across the nation in watersheds large and small, urban and rural.

Technical Assistance: The Office of Wetlands, Oceans and Watersheds (OWOW) recognizes the need for a strong base of scientific information as the foundation for making regulatory and nonregulatory decisions about resource protection and management and evaluating program success. The Office of Science and Technology (OST) is the primary technical support arm for all water programs and liaison with EPA's Office of Research and Development (ORD). OWOW works with OST and ORD to support research and develop technical guidance for programs. Technical support and information are provided to citizens, local governments, states and other federal agencies regarding water quality monitoring, assessment, and regulation.

Surface Water Quality Monitoring and Data Management: The Assessment and Watershed Protection Division prepares technical guidance for assessing water quality and program successes, develops water quality indicators, and coordinates surface water monitoring programs with related programs in EPA and elsewhere. Water quality data is available and useable nationwide through Storage and Retrieval (STORET) and other systems. A Geographic Information System (GIS) center to support water quality decision-making is being established. The Division also prepares the biennial National Water Quality Inventory, a report to Congress that aggregates and analyzes state reports of water quality data in a periodic snapshot of water conditions nationwide. Biological monitoring is being emphasized and supported through development and publication of protocols and methods. Guidance and a newsletter are also prepared to help volunteer monitoring programs nationwide.

US Department of Interior

U.S. Geological Survey, Water Resources Division

The mission of the U.S. Geological Survey (USGS) Water Resources Division (WRD) is to provide reliable, impartial, timely information that is needed to understand the Nation's water resources. WRD actively promotes the use of this information by decision-makers to:

1. Minimize the loss of life and property as a result of water-related natural hazards, such as floods, droughts and land movement.
2. Effectively manage ground water and surface water resources for domestic, agricultural, commercial, industrial, recreational and ecological uses.
3. Contribute to wise physical and economic development of the Nation's resources for the benefit of present and future generations.

The USGS WRD has neither regulatory nor developmental authority; therefore, its sole product is information.

Consistent with the USGS mission, the WRD provides impartial, credible, and excellent science that is applied to issues relevant to water resources management, protection from hydrologic hazards, environmental protection and other public policies. WRD's primary strengths include:

1. Collecting, quality assuring, storing and disseminating basic hydrologic data on the quantity and quality of water.
2. Conducting assessments of availability of water, quality of water, water use, and water related hazards at scales that range from single data collection sites to regional and national scale.
3. Conducting interpretative studies and developing predictive models that describe the potential consequences of water related management actions.

4. Providing knowledge and expertise to assist various levels of government (Federal, State, local) in understanding and solving critical water resources problems.
5. Developing new methods for acquiring water resources information, including methods of data collection, quality assurance, data management, laboratory analysis, data analysis and simulation modeling.
6. Producing new understanding that describes or explains processes important to water related issues.

Federal Water Quality Programs

The USGS WRD actively proposes and annually funds water quality programs of a National scope. These programs are funded solely from the annual USGS congressional appropriation. Two programs, which are significant contributors to the National water quality database, are the National Water Quality Assessment and the National Stream Quality Accounting Network programs.

National Water Quality Assessment Program (NAWQA):

The NAWQA program was conceived in 1986 through Congressional appropriated funds that mandated the USGS to test and refine concepts for a long-term program to:

1. Provide a nationally consistent description of current water quality conditions for a large part of the Nation's water resources,
2. Define long-term trends in water quality, and
1. Identify, describe and explain, as possible, the major factors that affect observed water quality conditions and trends.

After a 4-year pilot phase of the NAWQA program, a committee of the National Academy of Science evaluated the design and potential utility of the program and recommended full-scale implementation for 20 study units in 1991.

The Ozark Plateaus region was one of the initial study units to be assimilated into the NAWQA program. The study unit is approximately 48,000 square miles in size and includes parts of northern Arkansas, southeastern Kansas, southern Missouri, and northeastern Oklahoma. Boundaries of the study unit approximate the natural flow boundaries of the Ozark Plateaus aquifer system. The study objective is to examine the major factors that affect the quality of surface waters and to assess trends of water quality in Ozark streams. Interpretation and presentation of data is published in a series of reports. The area is of particular NPS interest because of the growing number of confined animal feeding operations within Missouri.

National Stream Quality Accounting Network (NASQAN):

The NASQAN program began in 1973 to provide nationally comparable information on water quality. Consistent with the design of the national streamflow-gauging network, water quality measurements were made at stations at the downstream end of most

hydrologic accounting units; hence, the term *accounting* in the network name. At its greatest extent, the network was funded at \$5 million annually and included more than 500 stations that were sampled monthly for suspended sediment, major ions (such as sulfate and chloride), trace elements (such as lead), nutrients (such as nitrate and phosphorus), sanitary indicators (such as fecal coliform), and limited biological information (such as chlorophyll-a). These data were intended to provide general-purpose information on the status and trends of water quality.

During 1993 and 1994, the NASQAN program underwent a major restructuring. This involved reducing the total number of stations and increasing the number of samples to be collected at each station. In addition, the parameter list was revised to include more of the chemicals, compounds and constituent elements that are relevant to current water quality management issues. Since 1995, the NASQAN program has focused on monitoring the water quality of four of the Nation's largest rivers--the Mississippi, the Columbia, the Colorado and the Rio Grande. NASQAN operates a network of 39 stations where the concentration of a broad range of chemicals, including pesticides and trace elements, and stream discharge are measured. From these data, source areas of contaminants can be identified; contaminants can be routed through the river system to determine gains and losses; and the amount of contaminants delivered to receiving waters--such as estuaries and reservoirs--can be estimated.

Three NASQAN stations are currently maintained in Missouri under the restructured program. These stations are the Missouri River at Hermann, the Mississippi River below Grafton, and the Mississippi River at Thebes. Samples are collected at these stations between 13 and 15 times a year. At least two samples are collected to represent events of extremely high flow including flood stage. About 100 dissolved constituents and 30 suspended constituents are measured in every sample. An extensive quality assurance/quality control program enables constituents present in very low concentrations (parts per billion) to be measured with definable accuracy and precision. Results are published annually by the Missouri District WRD office.

Water Resources Division Funding Sources

WRD achieves its mission by using funding from three distinctly different sources: (1) USGS Federal program funds, which provide 100 percent support for certain efforts; (2) Federal-State Cooperative program funds, which are a combination of Federally appropriated funds (up to 50 percent) and funds from cooperating agencies at the State and local level; and (3) reimbursable funds, which are contributed by various partners without any Federal match. Each source of funding brings its own benefits. The Federal program provides the foundation that allows WRD to address important national issues, and provides for the conduct of regional and national synthesis of data and information, which is unlikely to be funded by local, State and other Federal agencies. Federal programs also provide the primary source of funds for research and development, which is necessary for the long-term productivity of WRD and the hydrologic science community.

The Federal-State Cooperative program and the reimbursable program ensures the relevance of WRD work and helps WRD to identify emerging issues. The programs

provide a base of support for long-term data collection networks and interpretative projects that can be integrated to give regional and national understanding of the Nation's water resources. These programs and the Federal program also provide a network of field sites in diverse geographic and hydrologic environments where the USGS and others can test new scientific approaches, methods, and instruments under real world conditions.

Technical Assistance and Support Offered by the Missouri District

WRD activities in Missouri are conducted from three offices statewide by a staff of hydrologists, geologists, engineers, hydrologic technicians and support personnel. Consistent with the USGS WRD mission, the Missouri District is available to provide assistance in the collection and interpretation of water quality, ground water and surface water data. Below is a list of potential areas where the Missouri District can assist the NPS through either its Federal-State Cooperative or reimbursable funds program:

1. Data collection and interpretation to determine contaminants loads in runoff from agricultural areas to "waters of the state."
2. Calibrate hydrologic and water quality models for use in simulating water quality conditions of watersheds where minimal data are available.
3. Establish new baseline water quality monitoring networks or enhance existing networks to meet the demands of current water quality issues.
4. Refine the current understanding of the regional aquifers to better understand their susceptibility to the growing number of confined animal feeding operations (CAFO).
5. Provide storm water quality data collection and interpretation in urban areas.
6. Collect ground and surface water data to support the calibration of models to determine source area concerns for public and private drinking water resources.
7. Conduct research into the sources and types of microorganisms entering the hydrologic system as a result of the growing number of CAFOs.
8. Conduct biological monitoring as a tool in assessing stream health.
9. Using engineering models, show the affect of impoundment and other flow routing scenarios on the fate and transport of chemical and biological contaminants.
10. Conduct hydrologic and water quality assessments of implemented best management practices.
11. Refine the understanding of contaminant transport, on a large (watershed) scale, through the unsaturated zone within the various regions of the state.
12. Store all USGS collected water quality data in the National Water Information System data base.
13. Conduct geochemical investigations into environmental contamination resulting from mining and mine tailing storage.
14. Assess impacts of NPS contaminants on wetlands in Missouri.
15. Compute chemical mass balances in watersheds for determining contaminant assimilation capacities of receiving streams and lakes.

Fish and Wildlife Service

Partners for Fish and Wildlife: The US Fish and Wildlife Service (Service) began a national program in 1989 called Partners for Wildlife Program which was aimed at the restoration and enhancement of wetlands and associated uplands on private lands. Recently the program has expanded and the name changed to Partners for Fish and Wildlife. The program now includes the restoration and enhancement of riparian and in-stream habitats for fish, wildlife and federally-listed threatened and endangered species. In Missouri the program is being implemented cooperatively with the Missouri Department of Conservation (MDC). Its purpose is to restore and enhance wetlands, grasslands, streams and rare and declining habitats on private land through the establishment of fish and wildlife habitat development agreements or partnerships with private organizations, corporations and individual landowners.

The Service and MDC provide technical assistance to the landowner(s) with cost share being provided through the Service in exchange for a habitat development agreement stipulating that the restored or enhanced land will not be altered or modified during the term of the agreement. The cost share rate is 75 percent for ten years of program participation. Twenty-year or longer development agreements are possible at the landowner's discretion.

Challenge Cost Sharing: A companion program to the Partners for Fish and Wildlife Program, is the Challenge Cost Share Program which allows the Service to provide matching funds for projects that support the management, restoration and protection of natural resources on wildlife refuges, fish hatcheries, research facilities and private lands. The goal is to restore and enhance natural resources on federal and private lands in partnership with nonfederal public and private institutions, organizations and individuals. The Service provides up to 50 percent of the total project cost and cooperators provide the other 50 percent. Partners may contribute cash or in-kind services. A Challenge Cost Share Agreement defines the purpose and scope of the project, assigns partner responsibilities and certifies the contribution.

University of Missouri

The University of Missouri and University Extension provide the general public with research-based objective information. University Extension uses demonstrations and educational programming to show the practical application of this research to Missouri citizens.

Missouri is divided into eight Extension regions and serviced by regional specialists. University Extension's strong feature is the development and dissemination of educational programs and demonstrations. By combining the educational training and talents of regional Extension specialists, community programs cover a wider spectrum of problem solving techniques and skills. University Extension strives to develop working relationships in communities with citizens and other agencies. Educational programs,

demonstrations and in-service education seminars are available for agencies and the general public.

Water quality is a major focus area of University Extension on the state and regional level. Emphasis on educational programming, information and demonstration is used to promote water quality and continued learning throughout the state.

Missouri Watershed Information Network

The Missouri Watershed Information Network (MoWIN) is being established within the University Outreach and Extension Division to assist individuals, governmental and private agencies, schools and other groups in locating and accessing information about Missouri watersheds. MoWIN is a partnership of state and federal agencies, non-governmental organizations, natural resource interest groups, and private industry working together to facilitate access to watershed information in Missouri.

The goal of MoWIN is to help citizens increase their knowledge about current watershed conditions and best watershed management practices and strategies to improve Missouri's water quality.

MoWIN will provide information about: current watershed events and meetings, ongoing projects, local contacts, human resources, financial assistance, technical assistance, educational resources, and natural resource facts, reports and data. The information will be provided via the Internet, phone, fax, mail and personal visits.

Agriculture Private Sector

Agricultural organizations are a vital liaison between the government agencies and producers as leaders can help inform producers about new programs and regulations while giving input to agencies about such programs. The agricultural community has been extremely proactive in decreasing nonpoint source pollution by implementing a number of environmental programs, and by fostering a sense of cooperation between agencies and agribusiness.

Missouri Corn Growers Association

The Missouri Corn Growers Association is promoting NPS pollution prevention and cooperates in water quality initiatives that cut across agency and organization lines. It is embarking on BMP demonstration and watershed research projects to be implemented in various watersheds around the state. The projects will deal with pesticide runoff with the constituent of focus being atrazine. Potential management practices which will help reduce atrazine will be evaluated. Objectives are:

- A. Measure the effectiveness of selected management practices in reducing the runoff of pesticides, nutrients and sediment from crop fields, with specific emphasis on atrazine, nitrogen and phosphorus reduction.

- B. Monitor streams, tributaries and reservoirs in sub-watersheds to document trends and/or changes in pesticides, nutrient and sediment levels within these specific watersheds resulting from the implementation of selected nutrient and pesticide management practices.

Producers participating in whole field demonstrations targeting the effectiveness of selected management practices in reducing runoff will receive technical assistance, including nutrient, pest and forestry management and engineering support. Information will be collected on a field-by-field basis including all pesticide and nutrient applications, and the date, rate and type of product applied. Information will be gathered on tillage practices, timing, type of implement used, seeding dates, rates, varieties, all field inputs. This information will then be used to evaluate the economics of the cropping system through the use of the “MAX” program. (MAX, Farming for MAXimum Efficiency, is an economic management decision software developed by the Conservation Technology Information Center at Purdue University in Indiana.) All field locations and sampling stations will be tracked using a GPS mapping system.

Mo-Ag Industries Council

Mo-Ag Clean Pesticide Container Recycling Program

The Mo-Ag Clean Pesticide Container Recycling Program was established in 1991 to provide Missouri’s agrichemical dealers and growers with an alternative to landfilling clean pesticide containers. Goals for this program are three-fold:

1. To provide an environmentally sound method of disposing of used, clean containers
2. To prevent NPS caused by stormwater washing pesticide residues into waters of the state, and
3. To inform dealers and growers on proper methods of cleaning pesticide containers as required by law.

Because of the growing concern over illegally burning pesticide containers and other environmental concerns, the Agricultural Container Research Council (ACRC) was formed in 1992 to promote the collection and recycling of empty crop protection chemical containers into innovative, environmentally sound end uses. The organization supports state-level container programs by designating contractors to granulate and transport flaked containers to recycling centers from state approved collection sites. The assigned sub-contractor for the state of Missouri is Tri-Rinse, St. Louis Missouri. ACRC provides this vital service for state-level programs; however, Mo-Ag Industries Council meets the balance of the administrative and other expenses. Volunteers perform the work. Mo-Ag provides educational and promotional materials and protective gear including gloves, aprons, earplugs and boots.

The Mo-Ag Clean Pesticide Container Program begins in late winter and usually ends with collection of containers in August and October. The program targets the collection of high density polyethylene (HDPE) containers two and one half gallons or less, but will take up to 55 gallon ag chemical containers. Mini bulk containers can be recycled by

contacting the sub-contractor. In 1997, Mo-Ag collected over 140,000 pounds of ag chemical containers. The chipped containers are now being used to make plastic industrial pallets that are used at ag-chem facilities or distributions, which can be used again and again. Other end uses of the collected plastic have included new pesticide containers and energy recovery.

Environmental Studies Internship

In 1998, Mo-Ag plans to offer an internship program for students through the Environmental Studies program at the University of Missouri. By participating in the collection and granulation process, a student will be able to earn one or two credits toward his/her degree.

Missouri Soybean Association

Representative Farm Economical and Environmental Model

The MSA, (Missouri Soybean Association) and FAPRI (Food and Agriculture Policy Research Institute) initiated this program to provide farmers information on ways to improve profitability and the environment by keeping soil, nutrients and crop chemicals in the field where they belong. This computer model is being developed by FAPRI will include three major soil regions of Missouri. Four to five farmers and an ag chemical dealer develop representative farms for their soil region. The individual farmers combine their financial and management practices to develop a “model” farm.

This project will provide producers from each region economical and environmental information about current management (baseline) and alternatives (future options). With this information a producer will be able to identify what environmental and/or financial impacts can be expected from a practice, e.g., planting a cover crop. The model may suggest altering chemical and fertilizer timing or a major change in crop management, all with the goal of improving farmers’ profitability while protecting the environment. People who are planning or in the process of making changes to meet the requirements will receive a three-year membership to the MSA after they complete their projects.

MSA Environmental Excellence Award. This program is designed to recognize a person in the state of Missouri who has made outstanding strides in adopting environmentally friendly, economically sustainable, practices. This person also receives a cash award for achievement in preventing movement of soil, nutrients and crop chemicals.

MFA Inc.

Pesticide Container Recycling

MFA serves as a collection point for properly rinsed pesticide containers that are then transported to sites for recycling.

Custom Applicator Rodeos

MFA sponsors applicator rodeos which not only are competitions for skills but which also test the participants for compliance with rules and regulation associated with pesticide application.

Grass Buffer Strip Program

As a member of the National Council of Farmer Cooperatives, MFA is sponsoring a nationwide program which encourages agricultural producers to sow grass buffer strips along waterways to filter and reduce sediment and crop protection chemical runoff from agricultural fields.

Missouri Poultry Federation

The Missouri Poultry Federation makes available a compilation of BMPs with guidelines for litter management and dead-bird composting produced by the US Poultry and Egg Association, NRCS, the Tennessee Valley Authority and EPA. The Federation, working with the Poultry Task Force (public, private and industry representatives) is supporting efforts to achieve 100 percent participation of poultry contract growers in obtaining a voluntary “Letter of Approval” from DNR. A cooperative Poultry Federation/NRCS program in Barry County provides technical assistance to growers in soil and litter nutrient testing for planning application rates.

Poultry companies plan to become more involved in growers’ handling of litter. Flock servicemen visit sites weekly and will encourage BMP utilization and refer growers to appropriate sources for assistance. Independent contractors who haul litter will be addressed in hauler seminars.

Missouri Pork Producers Association

Environmental Assurance Program

The Environmental Assurance Program (EAP) began in Missouri in 1996 as an educational opportunity for pork producers. The original program included a basic understanding of environmental stewardship, a review of regulations, and an environmental audit to help producers plan for the future.

To continue addressing environmental issues, the National Pork Producers Council has developed five new modules that elaborate on specific areas of the original program. The modules are Composting, Odor Reduction, Manure Treatment and Storage Alternatives, Community Relations, and Pollution Prevention Strategies. The original EAP and the five new modules are currently available to producers through local workshops that are conducted by University Extension and Natural Resources Conservation Service personnel.

On-Farm Odor Assessment Program

The On-Farm Odor Assessment Program was developed to give individual pork producers advice on ways odor may be reduced and how they may improve environmental stewardship on their operations. The program will be conducted through site visits made by agricultural engineers and other resource people from University Extension, the Natural Resources Conservation Services, and private firms.

Following the on-farm visit, the participant will receive a written report regarding their operation. All information gleaned from the visit will remain confidential; it will be the

decision of the producer to implement the suggested changes. The program will be available to producers in March 1998.

Syngenta

Missouri Water Quality Program

Since 1995, Syngenta has offered a voluntary water monitoring program for triazine herbicide to any public water supply that wished to be involved. As of 1998, thirty-three public water supplies in Missouri participate in the program. Syngenta provides an immunoassay kit, mailing expenses and laboratory analysis. Both finished and raw water samples are taken by the public water supply twice a month except during late spring and summer where samples are taken weekly. Syngenta utilizes gas chromatography for split sampling of at least 10 percent of all samples.

Syngenta also partners with the Missouri Corn Growers Association and other federal and state agencies in the Watershed Research and Assessment Project. This five-year project will focus on agricultural field runoff reduction practices, education, outreach and the economics of such practices. Syngenta has also sponsored many federal, state, local and nonprofit water stewardship programs and meetings. In 1997, Novartis sponsored an Environmental Stewardship Award given through the Missouri Soybean Association.

IMPLEMENTATION ASSISTANCE CONTACTS

MISSOURI DEPARTMENT OF NATURAL RESOURCES

Water Protection & Soil Conservation

205 Jefferson Street
P.O. Box 176
Jefferson City, MO 65102

| | |
|-------------------------------------|----------------------------------|
| Soil and Water Conservation Program | (573) 751-4932 |
| Water Pollution Control Program | (573) 751-1300 |
| Public Drinking Water Program | (573) 751-5331 |
| Land Reclamation Program ALPD | (573) 751-4041 |
| Environmental Assistance Office | (573) 526-6627 (800) 361-4827 |

Geological Survey and Resource Assessment Division

| | |
|-------------------------|----------------|
| Water Resources Program | (573) 751-2867 |
|-------------------------|----------------|

205 Jefferson Street
P.O. Box 176
Jefferson City, MO 65102

| | |
|--------------------------------|----------------|
| Geological Land Survey Program | (573) 368-2100 |
|--------------------------------|----------------|

111 Fairgrounds Road
P. O. Box 250
Rolla, MO 65401

MISSOURI DEPARTMENT OF AGRICULTURE

| | |
|-------------------------|----------------|
| 1616 Missouri Boulevard | (573) 751-4211 |
|-------------------------|----------------|

P.O. Box 630
Jefferson City, MO 65102

MISSOURI DEPARTMENT OF CONSERVATION

| | |
|----------------------|----------------|
| 2901 W. Truman Blvd. | (573) 751-4115 |
|----------------------|----------------|

P.O. Box 180
Jefferson City, MO 65102

MISSOURI DEPARTMENT OF HEALTH AND SENIOR SERVICES

Information and assistance are available from health departments or nursing services located in most counties.

| | |
|--------------|----------------|
| 931 Wildwood | (573) 751-6400 |
|--------------|----------------|

P.O. Box 570
Jefferson City, MO 65102

US DEPARTMENT OF AGRICULTURE

Information and technical assistance are available from USDA service centers located in most counties.

Natural Resources Conservation Service
or Forest Service (573) 876-0900
Parkade Center, Suite 250
601 Business Loop 70 West
Columbia, MO 65203

Farm Services Agency (573) 876-0932
Parkade Center, Suite 225
601 Business Loop 70 West
Columbia, MO 65203

US ENVIRONMENTAL PROTECTION AGENCY

USEPA Region 7 (913) 551-7000
901 N 5th Street
Kansas City, KS 66101

US DEPARTMENT OF INTERIOR

Geological Survey (573) 308-3500
1400 Independence Road
MS 200
Rolla, MO 65401

Fish and Wildlife Service (573) 875-1911
608 East Cherry, Room 200
Columbia, MO 65201

UNIVERSITY OF MISSOURI EXTENSION

Contact the office in your county for information or assistance.

AGRICULTURE -- PRIVATE SECTOR

Missouri Corn Growers Association (573) 893-4181
3118 Emerald Lane, Suite 110
Jefferson City, MO 65109-6860

Missouri Ag-Industries Council, Inc. (573) 636-6130
410 Madison
P.O. Box 1728
Jefferson City, MO 65102

Missouri Soybean Association (573) 635-3819
P.O. Box 104778
Jefferson City, MO 65110-4778

MFA Inc. (573) 876-5226

201 Ray Young Drive
Columbia, MO 65201

Missouri Poultry Federation (573) 761-5610
225 East Capitol Avenue
Jefferson City, MO 65102

Missouri Pork Producers Association (573) 445-8375
6235 Cunningham Drive, Route 11
Columbia, MO 65202-9612

APPENDIX K

Proposed Water Quality Monitoring Program for Missouri

A PROPOSED WATER QUALITY MONITORING PROGRAM FOR MISSOURI

May, 1999

A comprehensive water monitoring plan includes components for monitoring both quality and quantity of surface and ground waters. A complete program includes:

1. **FIXED STATION NETWORK** where measurements are made, usually at fixed intervals at the same site over a period of many years. This network includes both chemical and biological monitoring sites.
2. **SPECIAL STUDIES** where a specific issue or question results in a relatively intense monitoring effort over a short period of time, usually to define cause and effect relationships. DNR uses these studies to support such actions as issuance of site specific, water quality based NPDES permits, documentation in support of enforcement actions for serious water pollution events and for development of water quality criteria.
3. **SCREENING LEVEL DATA COLLECTION** where large numbers of sites can be quickly evaluated for obvious water quality problems and can assist in directing more intensive monitoring.

Fixed Station Water Quality Network: Surface Water Chemistry

The present fixed station chemical water quality monitoring network in or near Missouri includes 108 sites of which 35 are cooperative sites jointly funded by DNR/WPCP and the USGS, two are cooperative sites jointly funded by DNR/DSP and USGS, six are funded by DNR/WPCP under contract with Crowder College and 65 are maintained by federal agencies, other states, cities and public water suppliers. In addition to this network, the University of Missouri, under contract to the Department of Natural Resources, has been monitoring water chemistry of approximately 110 lakes three times per year since 1988.

While a fixed station network of this size has served the water pollution control needs in the past, the relatively recent influx of large confined animal feeding operations (CAFOs), expansion of mining activities, continued controversy over gravel mining, and the need for more water quality information in and around critical watersheds in the state makes some additions to the present network advisable. DNR has recommended initiation of an additional 27 new monitoring sites and upgrading of six of the present sites. Included in this recommendation are three new stations in north Missouri to assess the impacts of existing large or other significant water contaminant sources, and upgrading of six existing sites in southwest Missouri to better assess the impacts of the significant poultry production in that area of the state. Several of the remaining new sites proposed would allow the department to develop information on existing water quality in areas which may some day be impacted by anthropogenic activities.

Existing and proposed expansions to the surface water chemistry network are shown in Element One below. Biological monitoring would be added to those sites appropriate for that type of monitoring.

Fixed Station Water Quality Network: Bioaccumulation of Toxics

From 1980 through 1993 DNR and EPA operated a cooperative Regional Ambient Fish Tissue Monitoring Program (RAFTMP) which analyzed whole fish (carp or redear sucker only) from about 20-24 fixed sites in Missouri annually. EPA changed the focus of the program in 1994 from one monitoring ecosystem health to one which more directly assessed human health impacts. The RAFTMP now has only 8 long-term sites monitored annually for whole fish to assess ecosystem health. Six additional fish fillet samples

to assess human health risk are taken annually. Individual sampling sites are monitored for one to three years.

Beginning in about 1983 when EPA reported fish in the Meramec River with elevated levels of chlordane and dioxin, the Department of Conservation began their own fish tissue monitoring network. This network did not use fixed sites, but changed most sites annually. It analyzed fish fillets from a variety of species. Thus most fish tissue data collected today is good for assessing human health risks but not so good for other fish eaters which may eat the entire fish (since fillets typically contain less contaminants by weight than the entire fish, analyzing the whole fish is a more sensitive indicator of bioaccumulatable toxicants).

New techniques for estimating bioaccumulatable substances using semi-permeable membrane devices (SPMDs) rather than fish tissue have been developed and are now in commercial use for organic compounds and are in development for heavy metals. If DNR finds this technology to be an acceptable and economically viable substitute for fish tissue sampling, it may replace fish tissue monitoring in part or in total. Specific monitoring locations are listed in Element Two below.

Fixed Station Water quality Network: Sediment Chemistry

One of EPA's major areas of emphasis in the last five years has been the development of sediment criteria. While this criteria development process has proceeded slowly, we anticipate that in the not too distant future, EPA will be urging states to adopt sediment criteria and begin monitoring sediments. DNR initiated a sediment sampling program in 1998. It includes both a fixed station component to document sediment quality on the major rivers and sediment monitoring in sites suspected of having sediment quality problems. Monitoring sites are listed in Element Three below.

Fixed Station Water Quality Network: Bacteria

Presently, bacteria data is collected monthly or 6 times annually at most fixed station chemical monitoring sites (see Element One). In addition, the Department of Natural Resources, DPHP conducts bacterial monitoring at approximately 20 swimming areas within Missouri State Parks and the Little Rock District, Corps of Engineers does some bacterial monitoring at swimming areas on reservoirs in their district, about 8-10 of these sites being in Missouri. Given the proper resources, DNR would like to upgrade the bacterial monitoring program in the following ways:

- a. conduct a survey of federal, state and local governments on the locations the most heavily used by swimmers.
- b. add bacterial monitoring to any heavily used areas not now monitored.
- c. all new sites plus existing sites should be monitored at least every two weeks during the recreational season as defined in the WQ standards.
- d. switch from the fecal coliform test to the E.coli test as the indicator of human health risk.

Element 1. Fixed Station Chemical Monitoring of Surface Waters

Note: If information is present in the "Agency" column, the site is presently being monitored by that entity. An "*" next to the "Location" column is a site not now monitored but proposed to be included in an expansion of the network. An "***" next to the "Location" column indicates a proposed upgrade of an existing station (increase in frequency and or parameter coverage).

| Waterbody | | Location | Agency | Coverage | Freq. | Comments |
|----------------|---|-----------------|-----------|----------|-------|----------|
| Mississippi R. | | Keokuk | IEPA-GA | c,m | 6 | |
| | | Alton | | c,m | | |
| | | Grafton | DNR-GS | c,m | | B,T |
| | | Ilsah, ILL. | IEPA-GA | c,m | 6 | |
| | | Canton | | c,m | | |
| | * | Hannibal | | c,m | | B,T |
| | | E. St. Louis | | | | |
| | | Cape G-Thebes | NASQAN-GS | c,m | 12 | |
| | * | Caruthersville | | | | |
| | | Memphis | USGS | c,m | | |
| Missouri R. | | St. Joseph | DNR-GS | c,m | 12 | B,T |
| | | ab. Kansas City | Water Co. | c,m,o | 12+ | |
| | | Kansas City | KDHE | c,m | 12 | |
| | | Sibley | | c,m | | |
| | | Jefferson City | | c,m | | |
| | | Hermann | NASQAN-GS | c,m | | B,T |

| Waterbody | | Location | Agency | Coverage | Freq. | Comments |
|-----------------|---|------------------|-----------|----------|-------|----------|
| | | ab. St. Louis | Water Co. | c,m,o | 12+ | |
| | | St. Louis | NBS/LTMP | C | 24 | |
| | | St. Louis | | c,m | 12 | |
| Des Moines R. | | Keosauqua, Ia. | IDEQ | c,m | 12 | |
| | | St. Fancisville | | c,m | 6 | |
| Fox R. | * | Wayland | | c,m | 12 | |
| Wyaconda R. | | | | | | |
| N. Fabius R. | | | | | | |
| M Fabius R. | | | | | | |
| S. Fabius R. | | Taylor | DNR-GS | c,m | 12 | B,T |
| North R. | | | | | | |
| South R. | | | | | | |
| Salt R. | | New London | | c,m | 12 | |
| Salt R. | | Center | STLCOE | c,m | 4 | |
| N.Fk.Salt R. | * | nr. Hunnewell | | | | B |
| M.Fk.Salt R. | | | | | | |
| Elk Fk.Salt R. | | | | | | |
| S.Fk.Salt R. | | nr. Santa Fe | | | | |
| Mark Twain Res. | | Several | STLCOE | c,m | 4 | |
| Cuivre R. | | Troy | DNR-GS | c,m | 6 | B,T |
| | | nr. Mouth | NBS/LTMP | C, | 24 | |
| Dardenne Cr. | | nr.mouth | NBS/LTMP | C, | 24 | |
| Peruque Cr. | | nr.mouth | NBS/LTMP | C, | 24 | |
| Tarkio R. | | Fairfax | | c,m | 4 | |
| Nishnabotna R. | | | | | | |
| Nodaway R. | | Oregon | | c,m | 12 | |
| | | Graham | DNR-GS | c,m | 12 | B,T |
| | | Burlington Jct | | c,m | 3 | |
| Big Lake Marsh | | Big Lake St. Pk. | | | | |
| Platte R. | | Platte City | | c,m | 12 | |
| | | Sheridan | | c,m | 3 | |
| | | Sharps Station | | c,m | 4 | |
| 102 R. | | Hopkins | | c,m | 3 | |
| Thompson R. | | Chillicothe | | c,m | 12 | |

| Waterbody | | Location | Agency | Coverage | Freq. | Comments |
|----------------------|---|--------------------|---------|----------|-------|----------|
| | | Cainsville | | c,m | 3 | |
| Weldon R. | | Princeton | | c,m | 3 | |
| Medicine Cr. | | Lucerne | | c,m | 3 | |
| Mussel Fk. | * | Mystic (below PSF) | | c,m | | N |
| L.Medicine Cr. | * | Galt (below PSF) | | | | N |
| Locust Cr. | | Unionville | | c,m | 3 | |
| Grand R. | | Sumner | DNR-GS | c,m | 12 | B,T |
| M.Fk.Grand R. | | Grant City | | c,m | 3 | |
| M.Fk.Grand R. | * | Albany (below CG) | | | | N |
| E.Fk.Grand R | | Allendale | | c,m | 3 | |
| Chariton R. | | Prairie Hill | DNR-GS | c,m | 12 | B,T |
| | | Livonia | | c,m | 3 | |
| E.Fk.Chariton R. | | Macon | | c,m | | |
| | * | Huntsville | | c,m | 12 | T,N |
| M.Fk.Chariton R. | | Salisbury | | c,m | 12 | |
| Lamine R. | | Blackwater | | c,m | 6 | |
| | * | Pilot Grove | | c,m | 3 | B |
| Blackwater R. | * | Nelson | | c,m | 3 | B |
| Moreau R. | | Jefferson City | | c,m | 3 | |
| Osage R. | | ab.Schell City | DNR-GS | c,m | 6 | B,T |
| | | St.Thomas | DNR-GS | c,m | 6 | B,T |
| | | nr.Warsaw | | c,m | 4 | |
| | | bl.Bagnell Dam | | c,m | 3 | |
| Baker Br. | | Taberville Prairie | | | | |
| B.Buffalo Cr. | | B.Buffalo Cr.WA. | DNR-GS | c,m | 6 | A,B |
| Coakley Hollow | | Lk.Ozarks St.Pk. | DPHP-GS | c,m | 6 | A,B |
| Hahatonka Spring | | | DPHP-GS | c,m | 6 | A,B |
| Truman Res. | | Several | | c,m | 4 | |
| S.Grand R. | | Urich | | c,m | 4 | |
| Marais des Cygnes | | Trading Post, Ks. | KDHE | c,m | 12 | B,T |
| | | Worland | | c,m | 12 | |
| L. Osage R. | | Fulton, Ks. | KDHE | c,m | 12 | |
| Marmaton R. | | Ft.Scott, Ks. | KDHE | c,m | 12 | |
| 1st Nicholson Cr.nr. | | Prairie SP | DNR-GS | c,m | 6 | A,B |

| Waterbody | | Location | Agency | Coverage | Freq. | Comments |
|-------------------------|---|-----------------|----------|----------|-------|----------|
| Sac R. | | Dadeville | | c,m | 12 | |
| Stockton Res | | Several | Spfd-CU | c,m | | |
| McDaniel Lake | | | Spfd-CU | c,m | | |
| Fellows Lake | | | Spfd-CU | c,m | | |
| Valley Water Mills Spg. | | | Spfd-CU | c,m | | |
| Sac R. | | Stockton | | c,m | 3 | |
| Pomme de Terre R. | | Polk | DNR-GS | c,m | 6 | B |
| PdT Res. | | Several | | c,m | 3 | |
| Pomme de Terre R. | | Hermitage | | c,m | 3 | |
| Bennett Spring | | | USGS | c,m | 12 | |
| Niangua R. | | bl.Bennett Spg. | DNR-GS | c,m | 6 | A,B,T |
| | | Windyville | NAWQA-GS | c,m | 4 | |
| Dousinbury Cr. | | nr.Wall St. | NAWQA-GS | c,m | 12 | |
| Maries R. | * | Westphalia | | c,m | 3 | B |
| Gasconade R. | | Jerome | DNR-GS | c,m | 6 | B,T |
| | * | Hooker | | c,m | 12 | B,T |
| | | Rich Fountain | | c,m | 3 | |
| Osage Fk.Gas.R. | * | nr.Drynob | | | | A,B |
| Lick Fk.Gas.R. | * | nr.Falcon | | | | A,B |
| Roubidoux Cr. | | Waynesville | | c,m | 3 | |
| Roubidoux Spring | | Waynesville | DNR-GS | c,m | 6 | A,B |
| Big Piney R. | | Devil's Elbow | DNR-GS | c,m | 6 | B,T |
| Paddy Cr. | | Slabtown Spg. | NAWQA-GS | c,m | 12 | |
| Shanghai Spring | | Devil's Elbow | DNR-GS | c,m | 6 | B,P,N |
| Meramec R. | | Eureka | | c,m | 6 | |
| | | Sullivan | DNR-GS | c,m | 12 | A,B,T |
| Courtois Cr. | | bl.Hwy.8 | DNR-GS | c,m | 6 | A,B |
| Huzzah Cr. | | bl.Hwy.8 | DNR-GS | c,m | 6 | A,B |
| Meramec Spring | | St. James | DNR-GS | c,m | 6 | S,B |
| Bourbeuse R. | | Union | DNR-GS | c,m | 12 | S,B |
| Big R. | | Richwoods | DNR-GS | c,m | 6 | B,N |
| Coonville Cr. | | St.Fran.St.Park | DNR-GS | c,m | 6 | A,B |
| Pickle Cr. | | Hawn St.Park | DNR-GS | c,m | 6 | A,B |
| Hdwtr Diversion | * | Allenville | | c,m | 12 | B,T |

| Waterbody | | Location | Agency | Coverage | Freq. | Comments |
|-------------------|---|--------------------|--------------|----------|-------|----------|
| Whitewater R. | | | | | | |
| Castor R. | | | | | | |
| St. Francis R. | | Several | | C | 6 | |
| | | Fisk | USGS | C | | |
| | | Silva | STLCOE | C | 7 | |
| | | Saco | | c,m | 12 | |
| | | Patterson | STLCOE | c,m | | |
| | | below Wappapello | STLCOE | c,m | | |
| Lake Wappapello | | Several | STLCOE | c,m | | |
| Big Cr. | | Sam Baker St.Pk. | DNR-GS | c,m | 6 | A,B |
| Little R. ditches | | Kennett | | c,m | 12 | |
| | | Hornersville | | c,m | | |
| | | Rives | DNR-GS | c,m | 12 | B,T |
| St.Johns Ditch | | | | | | |
| upper James R. | | Several | Spfd.CU | c,m | 6 | |
| James R. | | ab.Wilson Cr. | City of Spd. | c,m | 12+ | |
| | * | Galena | | | | B,R |
| Finley R. | | Riverdale | | c,m | 12 | |
| | | nr.mouth | City of Spfd | c,m | 12+ | |
| Kings R. | | Berryville,Ark. | ADPCE | c,m | 12 | B,R |
| Osage Cr. | | ab.Berryville,Ark. | ADPCE | c,m | 12 | |
| | | bl.Berryville,Ark. | ADPCE | c,m | 12 | |
| | | Alabam | ADPCE | c,m | 12 | |
| Longs Cr. | | Denver,Ark. | ADPCE | c,m | 12 | |
| White R. | * | bl.Beaver Res. | | c,m | | B,R |
| Table Rock Res. | | nr.dam | USGS-A | c,m | | |
| Roaring R. Spring | | | DNR-GS | c,m | 6 | A,B |
| Lake Taneycomo | * | Branson | USGS-A | c,m | 6 | B,T |
| N.Fk.White R. | * | Tecumseh | | c,m | 12 | A,B,T |
| Bryant Cr. | | Rippee W.A. | DNR-GS | c,m | | A,B |
| Double Spring | | Dora | DNR-GS | c,m | 6 | A,B |
| Norfork Res. | | Tecumseh,Udall | USGS | C | 6 | |
| Black R. | | Annapolis | | c,m | 12 | |
| | * | Poplar Bluff | | c,m | 12 | B,T |

| Waterbody | | Location | Agency | Coverage | Freq. | Comments |
|-----------------|---|--------------------|------------|----------|-------|----------|
| | | Corning,Ark. | ADPCE | c,m | 12 | |
| E.Fk.Black R. | * | Johnson Shut-ins | | | | A,B |
| Current R. | | Doniphan | DNR-GS | c,m | 12 | A,B,T |
| | | Van Buren | GS/NPS | c,m | 12 | |
| | | Pocohantas,Ark | ADPCE | c,m | 12 | |
| L.Black R. | | Several | | c,m | 6 | |
| Fourche R. | | Middlebrook,Ark. | | c,m | | |
| Spring R. | | Thayer | ADPCE | c,m | 6 | |
| | | Hardy,Ark. | ADPCE | c,m | 12 | |
| Mammoth Spring | | Mammoth Spg.,Ark | ADPCE | c,m | 6 | A,B |
| Eleven Pt. R. | | Bardley | DNR-GS | c,m | 6 | A,B |
| | | Pocohantas,Ark | ADPCE | c,m | 12 | |
| Greer Spring | | | USFS-GS | c,m | | A,B |
| Montauk Spring | | | NPS-GS | c,m | 2 | |
| Welch Spring | | | NPS-GS | c,m | 2 | |
| Pulltite Spring | | | NPS-GS | c,m | 2 | |
| Round Spring | | | NPS-GS | c,m | 2 | |
| Alley Spring | | | NPS-GS | c,m | 2 | |
| Blue Spring | | | NPS-GS | c,m | 2 | |
| Big Spring | | | DNR-NPS-GS | c,m | 6 | A,B |
| Current R. | | Montauk, Powder M. | NPS-GS | c,m | 2 | |
| Jack's Fk. | | nr.mouth | DNR-NPS-GS | c,m | 12 | A,B,N |
| | | at.Alley Spring | | c,m | 12 | |
| Spring R. | * | Waco | | c,m | 12 | T,N |
| | | Crestline | KDHE | c,m | | |
| Lost Cr. | * | Seneca | | c,m | 6 | B,N |
| Blue R. | | Stanley,Ks. | KDHE | c,m | 12 | |
| Indian Cr. | | Overland Pk.,Ks. | KDHE | c,m | 12 | |
| | | Leewood,Ks. | KDHE | c,m | 12 | |
| Perche Cr. | | McBaine | | c,m | 3 | |
| Cedar Cr. | | Columbia | | C | | |
| | | Ashland | | c,m | 12 | |
| L.Sac R. | | Walnut Grove | DNR-GS | c,m | 6 | P |
| Tebo Cr. | | Leesville | | c,m | 12 | |

| Waterbody | | Location | Agency | Coverage | Freq. | Comments |
|------------------------|----|---------------|--------------|----------|-------|----------|
| M.Fk.Tebo Cr. | | Leeton | | c,m | 12 | |
| W.FkTebo Cr. | | Lewis | USGS | c,m | 12 | |
| Dry Cr. | | Devil's Elbow | | c,m | 3 | |
| Meramec R. | | Paulina Hills | DNR-GS | c,m | 12 | P,N,T |
| | | Fenton | StL.Co.Water | c,m | 12+ | |
| Crooked Cr. | | Dillard | | M | 12 | |
| Big Cr. | | Chloride | | M | 12 | |
| Wilson's Cr. | | Brookline | DNR-GS | c,m | 6 | P |
| | | Battlefield | City of Spd. | c,m | 12+ | |
| James R. | | Several | City of Spd. | c,m | 12+ | |
| James R. | | Boaz | DNR-GS | c,m | 6 | P,T |
| Fall Cr. | | Branson | | | | |
| Roark Cr. | | Branson | | | | |
| Other Taney tribs. | | Branson | | | | |
| Main Ditch | | Neelyville | | c,m | 12 | |
| Center Cr. | | Cartersville | | c,m | 12 | |
| | * | Smithfield | | c,m | 12 | N,T |
| Turkey Cr. | * | Joplin | | c,m | 6 | P,N,T |
| | | Smithfield | | c,m | 12 | |
| Short Cr. | | Galena, Ks. | | c,m | 12 | |
| Shoal Cr. | * | ab.Joplin | | c,m | 12 | B,N |
| | ** | ab.Capps Cr. | DNR-CC | c,m | 12 | B,N |
| | | Galena, Ks. | KDHE | c,m | 12 | |
| L.Sugar Cr. | | Caverna | | c,m | 12 | |
| Elk R. | ** | Tiff City | DNR-CC | C | 12 | B,N,T |
| Indian Cr. | ** | Ginger Blue | DNR-CC | C | 12 | B,N |
| Big Sugar Cr. | ** | bl.Mikes Cr. | DNR-CC | C | 12 | B,N |
| LSugar Cr. | ** | Pineville | DNR-CC | C | 12 | B,N |
| Buffalo Cr. | ** | Tiff City | DNR-CC | C | 12 | B,N |
| Capps Cr. | * | nr. Mouth | | C, | 12 | B.N |
| Upper Huzzah & tribs | | | | c,m | 3 | |
| Upper Courtois & tribs | | | | c,m | 3 | |
| Indian Cr. | | | | c,m | 3 | |
| Neals Cr. | | | | c,m | 3 | |

| Waterbody | | Location | Agency | Coverage | Freq. | Comments |
|---------------|--|----------|--------|----------|-------|----------|
| Strother Cr. | | | | c,m | 3 | |
| Brushy Cr. | | | | c,m | 3 | |
| W.Fk.Black R. | | | | c,m | 3 | |
| Bills Cr. | | | | c,m | 3 | |
| Bee Fk. | | | | c,m | 3 | |
| Logan Cr. | | | | c,m | 3 | |
| Knob Cr. | | | | c,m | 3 | |

Element 2. Fish Tissue/Semi-Permeable Membrane Device Monitoring for Bioaccumulative, Trace Substances

| Waterbody | Location | Coverage | Freq. | Comments |
|---------------------------------------|----------|----------|-------|----------|
| * Mississippi River at Caruthersville | | soc,m | 1 | B |
| * Mississippi River at Grafton, Ill. | | soc,m | 1 | B,T |
| * Mississippi River At Hannibal, Mo. | | soc,m | 1 | B |
| ** Mississippi River at Thebes, Ill. | | soc,m | 1 | B,T |
| ** Missouri River at St. Joseph, Mo. | | soc,m | 1 | B,T |
| * Missouri River at Hermann, Mo. | | soc,m | 1 | B,T |
| ** Platte River nr. Platte City, Mo. | | soc,m | 1 | B |
| ** Grand River at Brunswick, Mo. | | soc,m | 1 | B,T |
| * S.Fabius River at Taylor, Mo. | | soc,m | 1 | B,T |
| * Blue River nr. mouth (KC) | | soc,m | 1 | P,N |
| ** Osage River at St. Thomas | | soc,m | 1 | B,T |
| ** Gasconade River at Jerome | | soc,m | 1 | B,T |
| * Meramec River at Sullivan | | soc,m | 1 | A,B,T |
| * Meramec River at Paulina Hills | | soc,m | 1 | P,N |
| * Big River nr. Richwoods | | soc,m | 1 | N |
| * James River nr. Boaz | | soc,m | 1 | P,N |
| ** Little Sac River nr. Morrisville | | soc,m | 1 | P |
| **Current River nr. Doniphan | | soc,m | 1 | A,B,T |
| * Black River near Annapolis | | soc,m | 1 | P |
| ** Little River ditches nr. Rives | | soc,m | 1 | B,T |
| * Center Creek nr Smithfield, Mo. | | soc,m | 1 | N |
| * Lake Taneycomo near Powersite Dam | | soc,m | 1 | B,T |

| Waterbody | Location | Coverage | Freq. | Comments |
|--|----------|----------|-------|----------|
| * 4-6 additional sites that would be rotated annually among other streams or lakes in the state. | | | | |

Element 3. Ambient Sediment Chemistry Monitoring

| Waterbody | Location | Coverage | Freq. | Comments |
|--------------------------------------|----------|----------|-------|----------|
| * Mississippi R. at Cannon NWR | | soc,m | 1 | B |
| * Mississippi R. at Riverlands EDA | | soc,m | 1 | B |
| * Mississippi R. at St. Louis | | soc,m | 1 | P,N |
| * Mississippi R. at Cape Girardeau | | soc,m | 1 | B |
| * Mississippi R. at Caruthersville | | soc,m | 1 | B |
| * Missouri R. nr. Bob Brown CA | | soc,m | 1 | B |
| * Missouri R. at Kansas City | | soc,m | 1 | P,N |
| * Missouri R. below Weldon Spring | | soc,m | 1 | B |
| * Blue River at Kansas City | | soc,m | 1 | P,N |
| *Grand River nr. Sumner,Mo. | | soc,m | 1 | B |
| *Locust Cr. at Fountain Grove CA | | soc,m | 1 | B |
| * Platte River at Platte City, Mo. | | soc,m | 1 | B |
| * S.Fabius River at Taylor,Mo. | | soc,m | 1 | B |
| * Creve Coeur Lake, St. Louis | | soc,m | 1 | N |
| * Gasconade River at Jerome | | soc,m | 1 | A,B |
| * Meramec River at Sullivan | | soc,m | 1 | A,B |
| * Crooked Creek below Buick smelter | | soc,m | 1 | P |
| * Meramec River at Paulina Hills | | soc,m | 1 | P,N |
| * Big River nr. Richwoods | | soc,m | 1 | N, |
| * L. Sac Arm, Stockton Reservoir | | soc,m | 1 | P |
| * James River at Boaz | | soc,m | 1 | P,N |
| * James R. Arm, Table Rock Reservoir | | soc,m | 1 | P,N |
| * Current River at Doniphan | | soc,m | 1 | A,B |
| * upper Clearwater Reservoir | | soc,m | 1 | N |
| * upper Wappapello Reservoir | | soc,m | 1 | N |
| * Big Creek below Asarco smelter | | soc,m | 1 | P |
| * Little River ditches at Rives | | soc,m | 1 | B |
| * Center Creek nr Smithfield,Mo. | | soc,m | 1 | N |
| | | | | |

| Waterbody | Location | Coverage | Freq. | Comments |
|---|----------|----------|-------|----------|
| * Turkey Creek at Joplin | | soc,m | 1 | P,N |
| * Elk River at Tiff City | | soc,m | 1 | B |
| * 4-6 additional sites that would be rotated annually among other streams or lakes in the state | | | | |

KEY:

Coverage

- c = Conventional chemical monitoring (water temperature, pH, specific conductance, dissolved oxygen, major ions, nitrogen, phosphorus, suspended solids, hardness, iron and bacteria).
- m = Heavy metals.
- soc = Synthetic organic chemicals (PAHs, PCBs, pesticides, volatiles).

Comments

- A = High quality site, data collection to enforce Antidegradation Policy in Water Quality Standards.
- B = Establish background water quality information
- P = Assess impact of one or more point source discharges.
- N = Assess impact of nonpoint sources(s).
- R = Nutrient monitoring for Table Rock Lake.
- T = Analyze for long term water quality trends.

Groundwater Monitoring

There would be two major components of the groundwater monitoring program. One, a network of wells of known depth and construction for water quality monitoring, and addressing such issues as suitability for drinking water and movement of saline-freshwater interface. Two, a network of wells measuring water levels and addressing issues such as rate of recharge, regional aquifer depletion (i.e., the Roubidoux in SW Missouri and NE Oklahoma), and profundity of cones of depression at sites like Springfield, Branson and Mexico. Both of these networks would cover all major potable aquifers in the state. Much water quality data is already available through ongoing monitoring by DNR/PDWP of public wells. A series of 50 wells would be added to the system, in cooperation between WPCP, PDWP, and DGLS. Semi-permeable membrane devices (SPMDs) would be used in a trial mode as part of this monitoring and if found appropriate, continued as a new tool for routine monitoring.

Surface Water Quantity Monitoring

This element of the monitoring strategy would upgrade the present flow monitoring network, to allow for additional monitoring at 20 sites. Presently, there are approximately 100 locations in the state where the USGS maintains instantaneous flow recording equipment. This proposal would allow flow monitoring to occur at locations that are critical for providing drinking water supplies as well as monitoring flow conditions and long term changes where significant water withdrawals occur or may occur, and in areas of interstate concern. The selection of these sites will be coordinated with PDWP and DGLS.

Biological Monitoring

In 1992 the Department of Natural Resources began a systematic sampling of the aquatic macroinvertebrate communities of 45 reference streams. These reference streams were picked because of the relatively good condition of the watershed they drained, the presence of a stable, permanently vegetated riparian zone and an absence of point source wastewater discharges. Sampling of these sites and selected sites with water quality or habitat impacts will lead to development of numeric biological water quality criteria within our water quality standards in three to five years.

When biological criteria are in place the department would add a few more reference streams and about 100 other stream locations across the state and begin a fixed station network of biological monitoring sites. These sites will be divided on an area proportional basis between the four ecoregions of the state prairie, prairie-ozark transition, ozark plateau, Mississippi Embayment. As a start, these new sites would be paired with new stations proposed for fixed station chemical monitoring.

The present reference sites are:

Prairie Ecoregion:

- | | |
|----------------------------------|-----------------------------------|
| 1. White Cloud Cr - Nodaway Co. | 2. Honey Cr. - Nodaway Co. |
| 3. E. Fk. Grand R. - Worth Co | 4. Grindstone Cr. - DeKalb Co. |
| 5. Long Br Platte - Nodaway Co. | 6. W. Fk. Big Cr. - Harrison Co. |
| 7. Marrowbone Cr. - Davies Co. | 8. No Creek - Livingston Co. |
| 9. W. Locust Cr. - Sullivan Co. | 10. Spring Cr. - Adair Co. |
| 11. E.Fk. Crooked R. - Ray Co. | 12. Petit Saline Cr. - Cooper Co. |
| 13. Burris Fk. - Moniteau Co. | 14. L. Drywood Cr. - Vernon Co. |
| 15. Middle Fabius R. - Lewis Co. | 16. North R. - Marion Co. |

Prairie-Ozark Transition:

- | | |
|-----------------------------|--------------------------------|
| 17. Cedar Cr.-Cedar Co. | 18. Pomme de Terre R.-Polk Co. |
| 19. Deer Cr.-Benton Co. | 20. L. Niangua R.-Hickory Co. |
| 21. L. Maries R.-Maries Co. | 22. Loutre R.-Montgomery Co. |

Ozark Plateau:

- | | |
|------------------------------------|------------------------------------|
| 23. Big Sugar Cr. - McDonald Co. | 24. Bull Cr. - Taney Co. |
| 25. Spring Cr. - Douglas Co. | 26. North Fork R. - Douglas Co. |
| 27. Jack's Fork - Shannon Co. | 28. Sinking Cr. - Shannon Co. |
| 29. Big Creek - Shannon Co. | 30. L. Black R. - Ripley Co. |
| 31. West Piney Cr. - Texas Co. | 32. L. Piney Cr. - Phelps Co. |
| 33. Meramec R. - Crawford Co. | 34. Huzzah Cr. - Crawford Co. |
| 35. Marble Cr. - Iron Co. | 36. Boeuf Cr. - Franklin Co. |
| 37. E.Fk. Black R. - Reynolds Co. | 38. Sinking Cr. - Reynolds Co. |
| 39. Rives aux Vases - Ste.Gen. Co. | 40. Saline Cr. - Ste.Gen. Co |
| 41. Apple Cr. - Cape G. Co. | 42. L. Whitewater R. - Cape G. Co. |

Mississippi Embayment:

43. Huffstetter Lateral Ditch - Stoddard Co.
44. Ash Slough Ditch - New Madrid Co.
45. Maple Slough Ditch - Mississippi Co.

Sites that have been sampled as part of the biocriteria development process that will probably be retained as fixed station biomonitoring sites include:

- | | |
|-------------------------------|-----------------------------------|
| 46. Clear Creek - Vernon Co. | 50. N. Blackbird Cr. - Putnam Co. |
| 47. McCarty Cr. - Vernon Co. | 51. E. Locust Cr. - Putnam Co. |
| 48. Horse Cr. - Cedar Co. | 52. W. Locust Cr. - Putnam Co. |
| 49. Brush Cr. - St. Clair Co. | |

The remainder of the sites must be evaluated in the field for suitability for this type of sampling and cannot be chosen at this time.

Beginning in 2001, DNR and MDC will begin a state-wide biomonitoring program for fish and aquatic macroinvertebrate communities. The program will monitor between 50 and 100 stream sites per year and will also measure the quality of the physical habitat of the stream site and collect some basic water chemistry data. About one-third of the sites will be randomly selected and the remainder will be selected based on potential or documented water quality concerns.

Special Studies

1. Wasteload Allocation Studies: DNR usually conducts 1 or 2 such studies each year. The results are used to develop a Qual 2e water quality model for a specific wastewater discharge and receiving stream and the model is then used to develop water quality based NPDES permit limits for the discharge. No expansion of this type of study is proposed.
2. Water Quality Studies of Specific Point and Nonpoint Sources: the Water Pollution Control Program usually conducts 3-4 abbreviated chemical studies per year to check on the status of streams below significant point or nonpoint sources to see if water quality standards are being met. This proposal would add an additional 2-3 studies per year to be performed by ESP personnel.
3. Large River Studies: None are presently being done. This proposal would request three such studies.
 - a. Impacts of wastewater discharges on the lower 22 miles of the Meramec River.
 - b. Delineation of mixing zones and water quality impacts of the Bissel Point and Lemay wastewater discharges on the Mississippi River.
 - c. Impacts of the KC metro area discharges on the Missouri River.
4. Eutrophication of Ozark Lakes. The University of Missouri is presently under contract to DNR to make a detailed study of Table Rock Lake and its tributaries, to characterize the degree of eutrophication, identify limiting nutrient(s) and construct a nutrient budget for the lake. This study would lay the foundation for any rule changes the department might undertake to mitigate eutrophication in this reservoir. This proposal recommends that this same type of study be extended to all large reservoirs on a consecutive basis, with each study of 3-5 years duration. Reservoirs to be studied would include: Lake of the Ozarks, Bull Shoals, Norfolk, Clearwater, Wappapello, Stockton and Pomme de Terre reservoirs.

Screening Level Data Collection

The Department of Natural Resources uses a variety of data sources as initial indications of water quality that may require more sophisticated monitoring to quantify. This rudimentary form of monitoring data is referred to as “screening level data”.

The major sources are:

1. Inspections and complaint investigations by DNR, MDC or other agencies.
2. Rapid stream assessments made by DNR/WPCP.
3. Data submitted by trained volunteers:
 - a. DNR/UMC lake volunteer monitoring program.
 - b. DNR/MDC stream water quality monitoring program.
4. Miscellaneous reports.
No expansion in this type of data collection is proposed.

BUDGET

FIXED STATION NETWORK

Surface Water Chemistry

| | |
|--|---------|
| 27 new sites 6 or 12 collections/yr. @ \$10,000/site | 270,000 |
| upgrade 6 SW Missouri sites @ \$9,000/site (contracted to USGS or private contractor) | 54,000 |

Surface Water Flow Monitoring

| | |
|---|---------|
| 20 new sites @ \$6,000 initial installation/site | 120,000 |
| 20 sites @ \$2,000 annual cost/site (contracted to USGS) | 40,000 |

Bioaccumulation of Toxics

| | |
|--|-------|
| fish collection 15 additional sites/yr. @ \$400/site | 6,000 |
| analysis 15 addn. composites for dieldrin series, PCBs, lead, mercury, cadmium @ \$600/sample and evaluation of SPMD for inclusion in ambient monitoring plans (0.35 FTE expansion ESP/FS section) | 9,000 |

| | |
|---|---------|
| Sediment Chemistry | |
| 35 sites, 1 collection/yr. @ \$300/site | 10,500 |
| analysis of 35 samples for heavy metals, dieldrin series, PCBs, PAHs, commonly used pesticides, and microtox screen for sediment toxicity @ \$1050/sample (0.35 FTE expansion ESP/FS section) | 36,750 |
| Bacteria | |
| sample collection at estimated 15 new sites, sampled 20 times/yr. | 12,500 |
| collection of 10 addn. samples/yr. at each of 30 existing sites | 12,500 |
| analysis of 600 samples @ \$30/sample (0.40 FTE expansion ESP/FS or regional office) | 18,000 |
| Groundwater Quality | |
| collection of water samples from 50 wells four times/yr. (0.10 FTE expansion ESP/FS or regional offices) | 20,000 |
| analysis of 200 groundwater samples for major ions, heavy metals, bacteria, nitrate-N, common herbicides @ \$350/sample (0.20 FTE expansion ESP/FS or regional offices) | 140,000 |
| Groundwater Levels/Aquifer studies | |
| measurement of 50 wells four times per year (0.10 FTE expansion DGLS) | 20,000 |
| Biological Monitoring (Aq. Invertebrates) | |
| 2.0 FTE expansion in ESP/FS section | 110,000 |
| additional water quality support monitoring | 10,000 |
| SPECIAL STUDIES | |
| Water Quality Studies of Discrete Point/NPS Areas | |
| 0.25 FTE expansion in ESP/FS section, E&E, analytical costs | 30,000 |
| One large river study per year | |
| 0.30 FTE expansion in ESP/FS section, E&E, analytical costs | 50,000 |

| | |
|--|--------|
| Eutrophication of Lakes Annual grant to Univ. of Missouri | 50,000 |
| Total maximum daily load (TMDL) analyses in addition to special studies noted above 0.5 FTE expansion in WPCP, E&E, analytical costs | 70,000 |
| Ambient toxicity of streams using sensitive indicator organisms to establish conditions and trends before widespread toxicity becomes apparent | 10,000 |

APPENDIX L

Section 319 Funding and the Clean Lakes Program

SECTION 319 FUNDING AND THE CLEAN LAKES PROGRAM

Introduction

In 1972, the Clean Lakes Program, a federal grant program, was established as section 314 of the Clean Water Act. The purpose of this program was to provide financial and technical assistance to States for restoration and protection of publicly owned lakes. Program activities were directed at diagnosing the condition of lakes and their watersheds, determining the extent and sources of pollution, developing feasible lake restoration and protection plans (Phase I Diagnostic/Feasibility Studies), implementing plans (Phase II Restoration/Protection Implementation Projects), and evaluating the longevity and effectiveness of various restoration and protection techniques (Phase III Post Implementation Monitoring studies). In addition, Clean Lakes Program funding could be used for statewide assessments of lake conditions (Lake Water Quality Assessment grants) and for the development of institutional and administrative capabilities to carry-out lakes programs.

Between 1976 and 1994 the Clean Lakes Program provided approximately \$145 million of national funding to address lake problems, but there have been no appropriations for the program since 1994. July, 1998 USEPA guidance states that Section 319, Nonpoint Source Program funding can be used to fund Clean Lakes projects. In order to be eligible for funding, lake and reservoir management needs must be clearly identified in each state's Nonpoint Source Management Plan as well as eligible management practices.

Lake and Reservoir Pollution Control

Water Quality Standards promulgated to protect Missouri's waters for designated uses form the basis for pollution control efforts for lakes and reservoirs. All lakes in Missouri that are considered to be "waters of the state," those not entirely confined and located completely on lands owned, leased or otherwise controlled by a single person or by two or more persons jointly or as tenants in common, are protected by the general criteria and antidegradation provisions of the Water Quality Standards. The general criteria prohibit conditions that include aesthetic problems due to suspended or deposited material, discoloration, odor or conditions harmful to aquatic life. The antidegradation requirements prohibit lowering of water quality unless such action is an economic or social necessity to the state. In addition, 415 classified lakes are covered by numeric criteria. Classified lakes include any lake that falls into one of the following three categories: (1) small public drinking water reservoirs; (2) large multi-purpose reservoirs; and (3) reservoirs or lakes with important recreational values. In Missouri, the primary sources of lake and reservoir impairments are sediment, pesticides, and nutrients (see 303(d) list, Appendix F).

Restoration and Management Techniques

Effective and appropriate Best Management Practices should be implemented to the extent possible in the watersheds of lakes and reservoirs impaired by nonpoint source pollution. Sources of pollution must be managed sufficiently, in some cases on a periodic or continuing basis, to assure that the pollution being remediated will not recur. Some lakes may require the implementation of in-lake management techniques in order to correct the impacts of past pollution. In-lake management techniques which had been funded under Section 314 can now be funded under Section 319 in the context of an appropriate Clean Lakes project (e.g. Phase II

Restoration/Protection Implementation Projects). The following in-lake management techniques are eligible for Section 319 funding:

- Phosphorus Inactivation
- Dredging
- Dilution and Flushing
- Artificial Circulation
- Hypolimnetic Aeration
- Hypolimnetic Withdrawal
- Sediment Oxidation
- Biomanipulation
- Algicides
- Water Level Drawdown
- Shading and Sediment Covers
- Biological Controls (Fish, Insects)
- Harvesting/Planting
- Herbicides
- Limestone Addition to Lake Surface
- Injection of Base Materials into Lake Sediment
- Mechanical Stream Doser
- Limestone Addition to Watershed
- Pumping of Alkaline Groundwater

Other projects that Section 314 funded that may now be funded through Section 319 include statewide lake assessments and lake volunteer monitoring programs.

REFERENCES

U.S. Environmental Protection Agency, 1990, The Lake and Reservoir Restoration Guidance Manual. EPA-440/4-90-006. Office of Water (WH-553), Washington, DC.

Wayland, III, Robert H. Memo to EPA Regional Water Division Directors and State and Interstate Water Quality Program Directors. 9 July 1998.